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MORE ABOUT THE NEW PRODUCT

A supervisor in one of the very largest cities on the Pacific coast writes us as follows:

I have found that manufacturers through their agents frequently force their wares upon school departments even though their products are not especially suited for the kind of work done at the school.

Almost every supervisor has been confronted with the experience of the new product which, unsuccessful though it has proved itself in school use, nevertheless continues to live on as a part of the school.

Nothing is more embarrassing than to be forced to face, month after month, a large piece of equipment which has shown itself unfitted for schoolwork. Frequently, too, the installation of such a piece of equipment spells the end of the professional life for the school executive who is responsible for it.

New products which are to be offered to schools should be marketed only after the most careful research and study. A manufacturer or dealer who does this and then offers his products to schools backed up not only by a consistent sales program, but also by the assurance of a persistent and constructive program of service is to be preferred.

The advertising pages of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION present to the school field products that not only have a definite school application, but also are backed by a promise of real service.

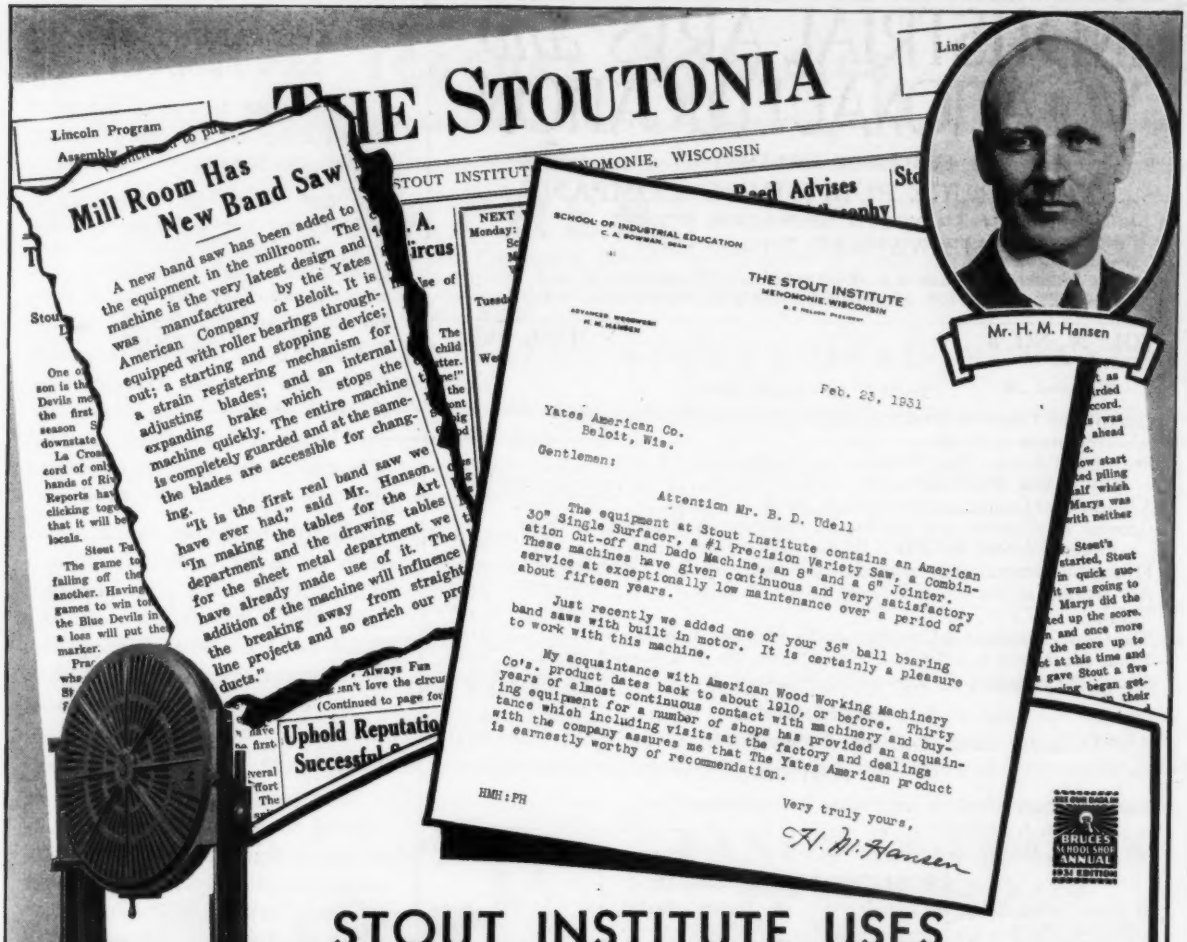
The appearance of an advertisement in this magazine is a guarantee of the school service of the product advertised.

THE PUBLISHER

THIS MONTH'S COVER

The picture chosen for the cover this month shows several of the memorial murals recently dedicated at the Tilden Technical High School, Chicago, Ill.

They are the work of James E. McBurney, a Chicago artist.


THE STOUTONIA
STOUT INSTITUTE, MENOMONIE, WISCONSIN
Mill Room Has New Band Saw
A new band saw has been added to the equipment in the millroom. The machine is the very latest design and was manufactured by the Yates American Company of Beloit. It is equipped with roller bearings throughout; a starting and stopping device; a strain registering mechanism for adjusting blades; and an internal expanding brake which stops the machine quickly. The entire machine is completely guarded and at the same-ing.
"It is the first real band saw we have ever had," said Mr. Hanson. "In making the tables for the Art department and the drawing tables for the sheet metal department we have already made use of it. The addition of the machine will influence the breaking away from straight line projects and so enrich our pro-ducts."
Mr. H. M. Hansen
SCHOOL OF INDUSTRIAL EDUCATION
C. A. BOWMAN, DEAN
THE STOUT INSTITUTE
MENOMONIE, WISCONSIN
Feb. 23, 1931
Yates American Co.
Beloit, Wis.
Gentlemen:
Attention Mr. B. D. Udell
The equipment at Stout Institute contains an American 30" Single Surfacer, a #1 Precision Variety Saw, a Combination Cut-off and Dado Machine, an 8" and a 6" Jointer. These machines have given continuous and very satisfactory service at exceptionally low maintenance over a period of about fifteen years.
Just recently we added one of your 36" ball bearing band saws with built in motor. It is certainly a pleasure to work with this machine.
My acquaintance with American Wood Working Machinery Co's. product dates back to about 1910, or before. Thirty years of almost continuous contact with machinery and buying equipment for a number of shops has provided an acquaintance which including visits at the factory and dealings with the company assures me that The Yates American product is earnestly worthy of recommendation.
Very truly yours,
H. M. Hansen
HMH:PH
BRUCE'S SCHOOL SHOP ANNUAL

STOUT INSTITUTE USES YATES-AMERICAN MACHINES

Hundreds of woodworkers now teaching owe their training to Mr. Hansen. His judgement on woodworking machinery is respected. He did not go wrong when he selected Yates-American. Neither will you.

Yates-American Y-36 Scroll Band Saw Selected by Mr. Hansen.

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Volume 20 JUNE, 1931 Number 6

Cement and Concrete Work for Junior or Senior High Schools

*Sylvan A. Yager**

INDUSTRIAL-ARTS teachers and supervisors who are seeking ways and means of enriching their industrial-arts program with a minimum expenditure of money and at the same time making the program more nearly representative of a cross section of industrial activity, will want to give some consideration to cement and concrete work.

It is almost inconceivable that cement, as we know it, is only a little over 100 years old, and yet the manufacture of cement is one of the most important of the industries in our country today. Although the Romans used cement very extensively in the construction of their buildings, temples, bridges, roads, aqueducts, etc., the art of cement making was lost when Rome fell, and the secret remained buried until 1824 when it was rediscovered by Joseph Aspdin, an English bricklayer.

Few people know about the elaborate and expensive equipment required for the manufacture of cement and the great care that is required to produce a high-grade product. This seems rather strange in the light of the extent to which cement is used today. Thousands of miles of concrete roads are built in the United States each year.

Some Applications

Very few people today live in houses in which concrete has not been used in some way or other. As a matter of fact, concrete is rapidly displacing certain other types of building material.

Reinforced concrete is the accepted standard for the modern city building where solidity of construction as well as beauty is required. Concrete is used almost entirely for our sidewalks, curbs, gutters, steps, etc. Concrete swimming pools and tennis courts are considered almost essential as a part of the modern city's recreational equipment. Ornamental products of a wide variety, such as lawn benches, urns, pedestals, flower boxes, sundials, etc., have been made of concrete and add greatly to the beauty of our parks, lawns, and gardens.

A modern farm plant would be entirely out of the question if it were not for concrete.

Modern sanitation as applied to our homes and cities really dates from the time we began to use concrete on a large scale.

In the light of these facts it is readily seen that it is quite valuable for the boys in industrial-arts classes to be given an opportunity to learn something about this material.

In addition to the above it may be well to keep the following ideas in mind concerning concrete:

1. Equipment for this type of work is comparatively inexpensive.
2. Cement work provides a very interesting type of experience for boys in both the junior and senior high school.
3. It also provides an excellent opportunity for correlation with other industrial-arts activities.
4. It provides an opportunity for presenting a large amount of important and valuable related industrial information.
5. A very large amount of excellent material can be secured without cost for use in teaching concrete.
6. Cement work may be given in the same room with other activities or in a special shop, depending upon the type and extent of the course desired.
7. A wide variety of work can be done, involving not only the making of projects in the shop, but also excellent types of practical work on the job.
8. Concrete work lends itself unusually well to the development of home project work to supplement and enrich the work done in the school shop.

Listed below are the specific objectives and suggested scope of work for a short-unit course in concrete lasting 12 weeks, with a minimum of 240 minutes per week.

Specific Objectives

1. To give the students some knowledge of the various kinds of concrete mixtures and the possible uses of each.
2. To acquaint the student with a product that is playing an increasingly important part in the industrial world today.
3. To study the more important types of concrete work.
4. To give the student some actual experience in the mixing, placing, finishing, and curing of concrete for various uses.
5. To conduct a few simple experiments that will enable the student to better understand proper methods of curing, proper selection of aggregates, methods of reinforcing, mixing, bleaching, and waterproofing.

*Indiana State Teachers College, Terre Haute, Indiana.

6. To study the occupational opportunities of the various types of cement and concrete work.

Scope of Work

1. A brief study of the qualities, characteristics and selection of aggregates.
2. A study of different concrete mixtures and the uses of each.
3. Mixing and casting various types of concrete garden and lawn projects, such as sundial, bird bath, flower box, urn, lawn bench, jardinière, pedestal, etc.
4. A study of materials and methods involved in coloring concrete.
5. A study of the proper methods of curing various types of concrete work.
6. Make any one or more of the following: A short walk, steps, curb, foundation, or small floor, involving the use of both fine and coarse aggregates.
7. To give some insight into commercial methods used in the production of concrete on a large scale.
8. Make two or three types of concrete posts with suitable reinforcing.
9. Make both the smooth and rock-faced concrete building blocks.
10. Take as many trips as time will permit, to commercial plants that make concrete products.
11. List in detail and classify the possible uses of cement and concrete.
12. Study the history and manufacture of cement.
13. Take a trip to a cement mill.
14. Acquaint the student with the methods used in making estimates of the amount of materials required for representative types of concrete work.

The equipment for a course in concrete work need not be elaborate or expensive. As a matter of fact, a very large part of it may be made in the school shop.

The following is a suggestive list of equipment for 9 students. (The quotations are only approximate and are for a medium grade of equipment.)

Equipment Required

Number	*Item*	*Approx. Unit Cost*	*Total Cost*
4	No. 2, square-edge D-handle shovels	$1.50	6.00
5	Trowels, 5" mason	.50	2.50
3	Trowels, plasterer's steel	1.50	4.50
12	*Tamps, small wood	to be made from scrap material.	
8	*Wood floats with handles, in assorted sizes	Can be made largely from scrap material	.50
1	*Sand screen, ¼-in. mesh (18 by 36 in.)	.50	.50
1	*Sand screen, ¾-in. mesh (18 by 36 in.)	.50	.50
1	*Sand bin, to hold at least 1 cu. yd.	3.50	3.50
1	Ten-quart hand sprinkler	1.00	1.00
2	Ten-quart pails	.50	1.00
1	*Mixing platform, 6 by 10 ft.	5.00	5.00
1	*Truck with small wheels, 2 by 3½ ft.	2.50	2.50
	Such tools as hammer, pliers, screw driver, hatchet, cold chisel, etc., will likely be found in most school shops, but if not they may be purchased for approximately		5.00
2	Edgers	.75	1.50
2	Groovers	.75	1.50
1	Mason's trowel	1.50	1.50
1	Level	3.00	3.00
1	*Small metal tamp	1.00	1.00
2	*Measuring boxes, ½ and 1 cu. ft. capacity		.65
2	*Tampers, weight about 15 lb.	.50	1.00
2	Wire brushes	.65	1.30
1	Water tub for curing small projects	3.00	3.00
1 lot	*Quarter-sawed oak for a dozen or more forms of a variety of designs of several projects	16.00	16.00
	Sheet metal for covering the cores of the forms should not cost over	2.00	2.00

*These items can easily be made in the school shop.

The forms will constitute the most expensive part of the equipment. It is quite possible to make a variety of modern forms which are satisfactory, but they wear out and are not so desirable as the metal forms.

If the forms are to be made in the school shop, they should be constructed of quarter-sawed hard wood (oak is satisfactory) and soaked in raw linseed oil for about 10 days. The cores can be "boxed up" and covered with metal.

If the forms are to be made in the school shop the approximate cost of the necessary equipment as specified in the foregoing will be $65.

If metal forms are to be used, it would be well to have forms for the following four projects to start with, and others can be added at a later date:

Square flower box	Approximately	$20
Bird bath (complete)	Approximately	70
Round jardinière	Approximately	45
Long flower box	Approximately	41

Even though the metal forms are used, it would be desirable to supplement the range of possible projects by making wooden forms for a few additional pieces.

The total cost of the equipment as specified, including the four metal forms, is approximately $241.

Sand and cement will be the most bulky of the necessary supplies and do not have to be purchased in large quantities. A yard of sand and 12 or 14 sacks of cement (gray) may be purchased at a time, and when these have been used a new supply may be ordered.

The variety of work attempted will determine the nature of the materials needed. If the course is to include color work, 15 to 25 lb. of mineral (mortar) color for each of the colors desired, will be necessary.

If selected aggregates (marble and granite) are to be used they can be purchased in bags and in a variety of colors.

For reinforcing the top of the lawn seat, 5/16-in. round, soft-steel rods will be found very satisfactory.

The bird-bath bowl should also be reinforced. Galvanized hardware cloth (½-in. mesh) probably makes the best reinforcing, but heavy wire may be used and if properly placed makes a very good reinforcing.

The cost of these supplies, of course, will vary somewhat in different localities, but $50 is a reasonable estimate for the cost of the supplies for the course, as outlined, to continue for 12 weeks. This does not in-

clude any estimates for jobs that may be done outside of the school shop, such as walks, steps, etc.

Concrete is one activity in which projects can be made quickly once the equipment has been installed. It would be possible to make a number of projects to sell and, in two or three years at the most, pay for several of the metal forms. The length of time it would take to pay for the forms by this method would depend on the number of projects made, and the price placed upon them. This plan also serves to interest the community in the industrial-arts program and may make possible a type of development that could not otherwise be contemplated with any reasonable degree of success.

A brief outline of a suggestive course in concrete follows:

Concrete

I. Definition
II. Uses
III. Tools and Equipment
IV. Factors Affecting the Strength of Concrete
- A. Selection of materials
  - 1. Aggregates
    - *a*) Definition
    - *b*) Classification
    - *c*) Testing
    - *d*) Washing and grading
    - *e*) Surface characteristics
    - *f*) Important requirements of a good aggregate
    - *g*) Measuring by weight and volume
    - *h*) Study and test local aggregate
  - 2. Cement
    - *a*) Composition
    - *b*) History
    - *c*) Kinds
    - *d*) Manufacture
    - *e*) Specifications and standards (A.S.T.M.)
    - *f*) Storage
    - *g*) Importance of the cement industry
  - 3. Water
    - *a*) Test
    - *b*) Water-cement ratio
    - *c*) Effect of too much water
  - 4. Admixtures
    - *a*) Kinds
    - *b*) Purpose of each
    - *c*) Governing their use
  - 5. Relation to the ultimate strength of concrete
- B. Proportioning and mixing
  - 1. Principles involved
  - 2. Recommended mixtures for different uses
  - 3. Water-cement ratio
    - *a*) Effect on strength of concrete
  - 4. Kinds of mixing
  - 5. Classification of mixes
  - 6. Consistency and workability
  - 7. Speed of mixing
  - 8. Use of admixtures
  - 9. Waterproofing
  - 10. Effect of proper grading of aggregates
  - 11. Voids
  - 12. Use of tests
  - 13. Laitance
  - 14. Relation to the ultimate strength of concrete
- C. Placing
  - 1. Tamping
  - 2. Spading
  - 3. Vibrating
  - 4. Effect of heat and cold on concrete
  - 5. Precautions to be followed when using concrete in cold weather
  - 6. Relation to the ultimate strength of concrete
- D. Curing
  - 1. General nature of the curing process
    - *a*) Result of chemical action
  - 2. Effect upon the strength of the concrete
  - 3. Methods of curing
  - 4. Need of moisture
  - 5. Curing temperature
  - 6. Initial set
  - 7. Final set
  - 8. Effect upon the watertightness of concrete
- E. Finishing
  - 1. Types of finishes
    - *a*) Leaving surface as produced by the form
    - *b*) Wood float
    - *c*) Steel trowel
    - *d*) Selected aggregates
    - *e*) Cement-water wash
    - *f*) Tooled surface
    - *g*) Painting
    - *h*) Immersion
    - *i*) Color pigments
    - *j*) Stucco
    - *k*) Brush
    - *l*) Sponge floating
    - *m*) Sand blast
  - 2. Advantages and disadvantages of each type
  - 3. Typical use of each type

V. Construction of Forms
- A. Types
- B. Kinds of wood best suited for forms
- C. Preparing and placing forms
- D. Cleaning
- E. Care of forms in the school shop

VI. Simple Reinforcing
- A. Principles involved
- B. Purpose of reinforcing
- C. Kinds of reinforcing
- D. Study illustrations and make models
- E. Proper placing of reinforcing material

VII. List of Suggestive Projects
- A. Projects that can be made in the school shop
  1. Home plate for baseball
  2. Chimney cap
  3. Shoe scrape
  4. Book ends
  5. Lamp base
  6. Anchor weights
  7. Concrete dish for bulbs
  8. Concrete post
  9. Paper weights
  10. Test blocks for experimental work
  11. Porch column caps
  12. Concrete flagstones for garden walk
  13. Lawn roller
  14. Base for vaulting or jumping standards
  15. Cistern covers
  16. Well curb (can also be used for flower beds)
  17. Bird house
  18. Door stop
  19. Tea tile
  20. Tamper
  21. Flower box
  22. Jardinière
  23. Bird bath
  24. Pedestal
  25. Lawn or garden bench
  26. Urn
  27. Sundial
  28. Concrete blocks
  29. Concrete bricks
  30. Concrete tile for fireplace hearth
  31. Window sills for brick-veneer house
  32. Head stone for grave
- B. Projects that will have to be made "on the job"
  1. Walk
  2. Steps
  3. Garage floor
  4. Ash pit
  5. Sand box
  6. Concrete trough
  7. Curb
  8. Drain
  9. Feeding floor
  10. Auto washing floor
  11. Manure pit
  12. Hot bed
  13. Simple lawn fountain
  14. Short driveway
  15. Ornamental rock flower bed
  16. Ornamental rock pedestal for garden or lawn
  17. Engine base
  18. Repairwork
  19. Block for laundry stove in basement
  20. Well top
  21. Dog house
  22. Trash receptacle and refuse burner
  23. Lily pond
  24. Duck pond
  25. Wading pool

VIII. Estimating
- A. Approximate methods
- B. Methods of computing quantities of materials
- C. Use of tables and formulas
- D. Determination of unit costs
- E. Checking results

IX. Occupational Study and Visits to Concrete and Cement Industrial plants

Providing Effective Shop Training for Apprentices—I

*Robert W. Tarbell**

APPRENTICESHIP is a business proposition. In the early days it grew up as a family custom, where father taught son in his own little shop, usually at home. Trade skills were handed down from generation to generation until it became the practice to have apprentices as understudies to the masters. There grew up a rather definite feeling of social responsibility among both masters and journeymen regarding the training of apprentices. These early notions were reflected in the ideals and activities of the guild systems of Europe. As the Industrial Revolution gained headway, small home shops began to disappear. More and more the industries became institutions set apart. They developed into larger and more formal enterprises, took on more employees, and built up an industrial organization. Apprenticeship still continued as a matter of course, although it gradually began to decline due to a number of causes which can scarcely be discussed within the limits of one article. The process went on over a period of years, during which time the industries showed little concern about the outcome. When the shortage of skilled mechanics began to be felt in America, especially during the past two decades, employers began to consider definite means for meeting the situation. This paper will discuss several phases of shop training for apprentices, in the attempt to show how it is carried on at present.

Training of Apprentices

The management of industry is concerned with more things than manufacturing and selling. Converting raw materials into a finished product and getting the goods on the market do not constitute all the activities of an industrial plant. Without attempting to discuss how industrial management is changing its viewpoint, from the output of goods to the upbuilding of an intelligent and responsible working force, be it said, to the credit of management, that more attention is being given to the human side of industry. Analyses of the human element are being made to find the best place for each person. It is not to be wondered at, then, that industry should be taking stock of its man power, just as it inventories its raw materials or plans a new sales campaign. Industrial plants are being more and more concerned with personnel problems.

It can be reasoned very easily that industry must replace the mechanics it is using up, or the supply of skilled craftsmen will be depleted. American manufacturers have said for some time that there is a scarcity of good foremen and expert journeymen. They have decried the fact that so many workmen lack the necessary industrial intelligence to carry on their work properly. In the early days an employer could recruit his help from the small shops in America, or he could obtain them from Europe. Times have changed, however, and these two sources can be counted on very little by the manufacturer of today. The small shops are disappearing, and large plants are taking their places. As these combine in corporations, to produce on a large scale, the skill of the all-round mechanic is lacking, because apprentices do not have the complete training which the small shop afforded. The character of European immigration has been changing in recent years. Many immigrants formerly came from northern and western Europe. They were, for the most part, highly skilled mechanics. In recent years the influx has been more from the southeastern countries of Europe, consisting largely of cheap labor.

The American manufacturer is at last awakening to the fact that he must train journeymen as he goes along. For every craftsman who dies, or goes on the pension list, there must be an apprentice in training, ready to step into his place. This has brought the American manufacturer, taken in the aggregate, face to face with a problem of major importance, that of replenishing the ranks of skilled mechanics, which have been growing thinner since the decline of apprenticeship began. To this end, different kinds of schools have been started to give trade training. One of these types is the trade school which came into existence in America in 1881. It was thought for a time that schools of this kind would supply all the young mechanics needed. Expansion in this direction during the past half century has been very limited, and today the annual list of graduates of all the trade schools in the country is but a bare trace of the new mechanics needed. Disappointed in this direction, industries have tried corporation schools and vestibule schools. These are an aid, but the truth comes home with an ever-compelling force that there is no quick way of preparing a skilled craftsman, one whose training has been built upon a thorough foundation of experiences obtained, under actual working conditions. This puts the burden back upon industry. It must become a part of the policy of industry to train its staff of workmen.

Problems of Shop Management

One of the best ways to find out the problems and difficulties in a piece of work is to attempt to do it. Another way is to collect opinions from others who have experience in the field. There are several items

*Division of Instruction and Research, Milwaukee Vocational School, Milwaukee, Wisconsin.

to be considered in the management of apprenticeship in the shop. The following discussion is the result of experience, observation, and conferences.

There are several ways by which apprentices are inducted into service. Employers frequently resort to advertising to secure boys for the trades. Lists of applicants are then scanned and inquiries about the applicants may probably be made at the schools of the city. After making contact with a boy and his parents, he is informed about the nature of the job. If conditions appear favorable to all parties, an agreement, or indenture, more or less formal, is entered into, and the boy starts to work. The contract may be supervised by the state, as in Wisconsin, or it may be a private arrangement between the employer and the boy.

It would appear rather simple to start boys out in the trades by the foregoing procedure, but it is not always easy to get the proper apprentices. It is a difficult matter to judge of a boy's fitness for apprenticeship before he is indentured. The boys who would make the best tradesmen are often drawn away into other pursuits. There seems to be some considerable correlation between good general ability and ability to specialize in most any field. This means that the promising boys in school will do well in several fields and are taken for other work before the trades get them.

Wage difficulties and misunderstandings sometimes delay boys who would otherwise take up apprenticeship. They hesitate to start because the initial cash pay seems low. They do not see at first that compensation comes in two parts: the pay envelope and education. When they see other boys employed on a piecework basis, earning a little more money, they sometimes become restless and dissatisfied with the conditions of apprenticeship. This is the result of a misunderstanding. These boys must be convinced that the rewards of apprenticeship consist of more than the immediate pay envelope, and that a part of their pay is in the form of instruction.

Fluctuations in industrial conditions have an effect on the period of apprenticeship, as well as on the attitude of employers and boys toward it. These fluctuations in industry cannot be avoided or altered much by the employer. He, as well as the employee, is the victim. It may happen that an employer will find it necessary to close up his shop during a dull season. The apprentices, as well as the journeymen, may be laid off, in whole or in part, for a few weeks or months. This will, of necessity, lengthen the period of apprenticeship. This, in reality, is not a serious drawback over the country at large, however, as the boys are usually kept at work. Again, there are boys who hesitate to sign an indenture for fear that their parents may move away during dull time.

The trade partly determines the general plan to be followed in the method of management and routing of apprentices through the various departments of the plant, during the period of the indenture. In some places the contract specifies the different processes of the trade to be learned. The boy is placed at one of these processes and advanced through the different departments according to the prescribed schedule. Variations from this arrangement are sometimes caused by conditions which cannot be avoided. It may be better to alter the program somewhat to give benefit to boys who would profit by extra time in certain departments. Where a system of apprenticeship is on a firm basis, there is usually a supervisor in the shop to supervise the routing and management problems.

There are certain elements of cost to the employer in a plan of apprenticeship. There is the matter of overhead, consisting of records, supervision, etc.; instructional charges, as the time of a journeyman or foreman to instruct the apprentice; breakage losses and waste of materials by the apprentice during the learning period; and capital charges on space and equipment during the years of low productivity. The cost of an apprentice varies from one year to the next and from one month to the next. At the beginning he is the least productive and requires the most instruction and supervision. As he advances in the trade, he becomes more dependable, more productive, and needs less supervision. It is difficult to say whether or not he pays for himself during the period of apprenticeship. Apprenticeship is a charge which industry must carry, in part, even if there are no returns during the period of the indenture. During the latter part of this period, the apprentice is producing at a fairly rapid rate, with a lessening amount of supervision and for moderate wages. He is thus repaying some of the extra service rendered him at the start. Also, scientific methods of management in the routing and scheduling of apprentices will go far toward decreasing the expense and increasing the returns, without lowering the standard of instruction.

Summing up these several paragraphs on shop management, it seems quite evident that industry can no longer afford to throttle the supply of skilled workmen by a program of careless waste. The supply must come from young, new mechanics, thoroughly trained in modern craftsmanship. Industry itself is the agency most vitally interested, because it is the first to suffer through a shortage of mechanics. Industry, therefore, must assume the burden of training.

Nature of Shopwork for Apprentices

Wherever an adequate system of apprenticeship is in operation, there must be some organization for carrying on instruction. Under the old plan of industry, where master and apprentice worked side by side, the learner acquired his training in craftsmanship as a by-product of the day's work. The process was largely one of gaining handicraft skill. The apprentice worked at the things that came to the shop. This same fundamental principle has been followed down to the present time. In a large measure it seems to be the central core, around which the whole training program must

revolve. There has been considerable difference of opinion among people as to the proper nature of shopwork for apprentices. Some have advocated a miniature shop in connection with the industry, where boys could be taught the processes of the trade in a logical, sequential manner. Some have said that we should arrange the jobs in the plant in a proper sequence for instructional value to the boy. Various plans have been advanced, some less valuable than others. It seems quite apparent that the hurry and bustle of industry itself contains something of instructional value, something which other formal plans do not have. The real job has an atmosphere of genuineness about it which is not only fascinating, but instructive as well. Probably we shall find that the best type of shopwork for apprentices will be in a regulated plan of production work, under market conditions of procedure. There must be a scientific plan, administered intelligently, which however does not rob the boy of the industrial contact. Therein lies one of the greatest values for him. This is essentially the idea followed in most industries. Of course, there are far too many places where there is very little intelligent procedure. Too often the boy gets a maximum of industrial contact with a minimum of instruction.

Apprentices are usually put on production work as soon as possible. They are required to meet the same standards of workmanship as journeymen. When doing production work, they usually occupy a place near a journeyman or foreman, to whom they can readily turn for advice. They run machines, do the benchwork, and assemble parts. A casual observer would have difficulty in distinguishing between the work of an apprentice and a journeyman, except for the fact that the boy has a youthful appearance and occasionally needs a bit of instruction. When a boy has received sufficient instruction to enable him to go ahead on a certain piece of work, he may not need any more help for the rest of the day or for several days. The danger is that he will be kept too long on given operations, after he has become proficient in them. The average apprentice will learn the trade under the regular run of industrial conditions, provided his time is so allotted that he will have an even distribution of experience over the various activities in the trade.

(To Be Continued)

A Vocational Course in Boatbuilding

*J. I. Sowers**

So far as the writer knows, the vocational boatbuilding course at Miami is the only course in vocational boatbuilding thus far operated as a part of any public-school system. The Miami course was instituted for the following reasons: In the school year 1927–28, a 50 by 200-ft. Trucson steel building with a 40 by 60-ft. annex was completed in which to locate the industrial and vocational work of the school plant at the agricultural high school. This building, partly equipped, cost $43,800. Originally it was intended to place a general shop, including the building trades, the metal-working trades, electricity, and automobile work into this shop. With the serious curtailment of school funds however, it was found inexpedient to go forward with the development of the general shop, when the building was finished.

Small outboard motor boats as well as model boats had been built in several of the schools of Miami, and it was this that suggested the idea of using the general-shop building for the development of a course in boatbuilding. The building (see interior shown in Fig. 1) was just what was needed, large, high, roomy, and almost empty, with a considerable portion of the Atlantic Ocean right at its front door.

The work was begun in the school year of 1928–29. The matter of suitable instructors was solved by employing one man who had many years' experience in all kinds of boatbuilding work, and who had been for some years foreman in some of the leading boatyards, and giving him, as assistant instructor, a teacher who formerly had charge of the course in building engineering. This latter teacher also was to study the content of the boatbuilding course, and as fast as possible develop it into correct teaching units. In this way the work was started under the supervision of one good boatbuilder, and one good teacher.

The first boat to be undertaken was built for the president of the school board. It is a cabin cruiser, and is shown in Figure 2. It was named *Estudiante,* which is Spanish for "student-built." It was completed in a little over one school year. It is a very trim craft, 50 ft. in length, with a beam of 12 ft., and has a selling value of about $20,000. The same year another boat, the *Jewel of Miami,* shown in Figure 3, was started for a private owner. This boat is somewhat larger and more pretentious than the first. Aside from these larger boats, a number of smaller ones were constructed and launched. These include a sea-scout boat, a fishing yacht, and a number of outboard motor boats. In each case the person for whom the boat is being built furnishes all of the materials and the students do the work.

It is strange that boatbuilding is not more generally introduced into vocational and industrial courses, especially in cities where boatbuilding is a local industry. As a course it has many things to recommend it. Some of these are:

1. Students trained in this subject have command of many of the factors in several other trades, such as

*Director Vocational Education, Miami, Florida.

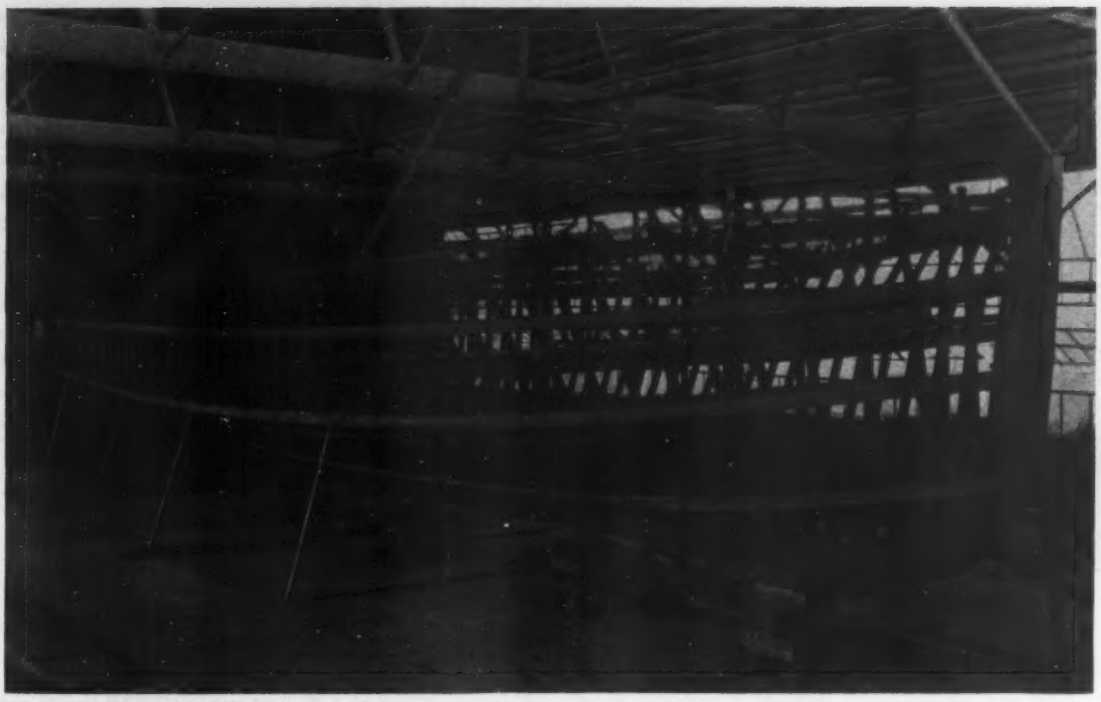


FIG. 1. THIS PICTURE SHOWS THE SKELETON OF A BOAT READY FOR PLANKING IN THE MIAMI BOATBUILDING SCHOOL

installing motors, wiring for lighting, cabinetmaking, wood finishing, plumbing, carpentry, and many other minor operations.

2. The equipment required represents a very small financial investment. Aside from a circular saw, and a band saw, only hand tools are used.

3. It is possible to supply all materials used without cost to school.

4. There is a constant demand for men well trained in boatbuilding, and they earn high salaries.

5. It is an all-year occupation.

The number of students in this boatbuilding course during the past two years has been about twenty. The experiences gained during this time will permit the reorganization of the work in such a way as to take care of much larger numbers of students at one time.

It also has been learned that boatbuilding can be taught best by confining it to the making of smaller boats. When boats take a year or two to build students lose interest in them. Then, too, a student working on

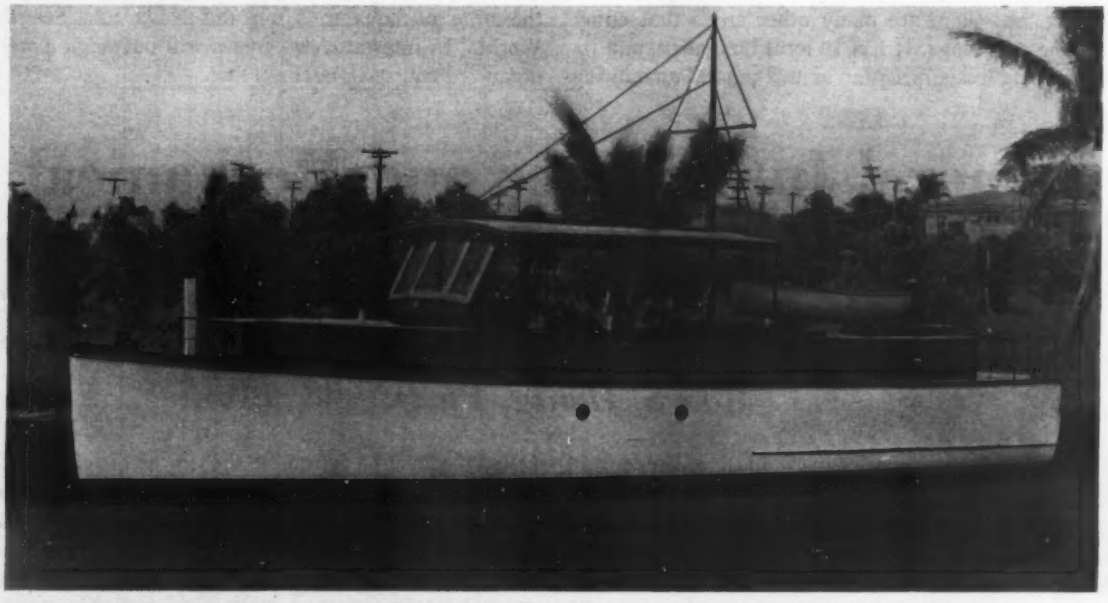


FIG. 2. THE "ESTUDIANTE" IS THE FIRST YACHT BUILT IN THE MIAMI VOCATIONAL BOATBUILDING SCHOOL. IT HAS MADE A NUMBER OF TRIPS TO CUBA AND CRUISES ALONG THE EAST COAST

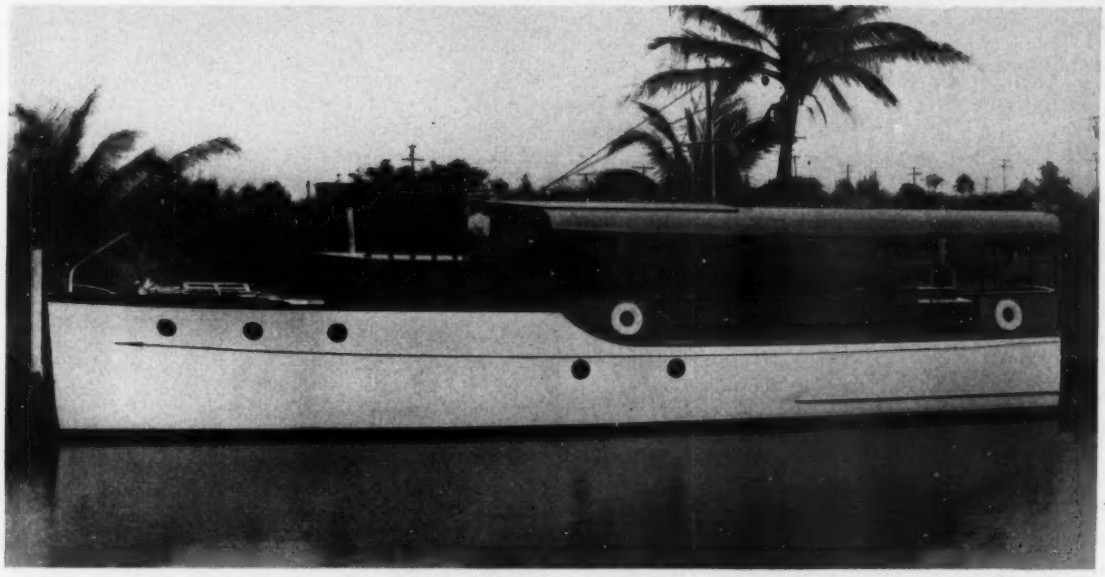


FIG. 3. The "Jewel of Miami," shown above, has a length of 55 ft. with a 13-ft. beam. It is equipped with two Cummings-Diesel motors, has comfortable accommodations for ten passengers and a crew of three. It has its own special lighting system consisting of two 32-volt motors, one mounted on each motor. No expense has been spared in construction and decorative features of the vessel, and every convenience known to modern yachting construction has been installed. The boat is finished in solid mahogany. The owner of this boat, of course, furnished all materials and equipment used in its building.

this type of boat may come into the school and go out again without seeing a boat laid out, or performing many of the operations required in the making. No boat should be undertaken that requires more than a semester to build. A 30-ft. boat is big enough to attempt in a school. Such a boat represents just as much in the way of instruction as the larger boats. Many of these smaller jobs can be under construction at one time and a number of different types of boats represented in the construction. A class recitation room, and a drafting room, conveniently located to the shop, should be available.

Miami is ideally located for the teaching of boatbuilding, but there are many other cities that enjoy the same advantage. It has 10 local boatyards, and its boatbuilding industry has an annual payroll amounting to about $700,000. The students developed in the boatbuilding course readily find employment when fully equipped for the work.

In point of interest boatbuilding is one of the most interesting of courses. Ever since men first went down to the sea in ships, the heart of man has been thrilled with the idea of a "boat." The roar of the ocean against a rock-bound coast is at once the most primitive and the most majestic of music to the ear of man. Over far-flung horizons man has visioned new lands, washed by strange seas, lands yielding rich treasure in money, adventure, and in conquests. It is this restless spirit that has lead to discovery, world navigation, and to the urge of boys to "Join the Navy and See the World." In interest, few courses will outweigh a well-organized course in boatbuilding.

General Intelligence and Mechanical Aptitude in Relation to Trade-School Success

*Max S. Henig, Ph.D.**

GENERAL intelligence, mechanical aptitude, and trade skill, have generally been tacitly accepted as contributing in varying degrees to an apprentice's chances for ultimate success in his trade. The following is an account of a statistical study made in a vocational school to determine the degree of relationship among them and a forecast of each apprentice's chance of success made by his instructor. The findings appear to be significant, particularly in that they show for these boys a noticeable degree of correlation between general intelligence and mechanical aptitude, neither of which, however, appears to play any great part in

*Instructor Nonrelated Subjects, Essex County Vocational Schools, Irvington, N. J.

the record the apprentice makes for himself in the school shop or in his chances for a successful career in industry.

The data were gathered at the Irvington unit of the Essex County (New Jersey) Vocational Schools. One hundred and twenty boys were tested by the army alpha and the Stenquist mechanical aptitudes tests. The ratings given these boys by their trade instructors as well as their forecast of each apprentice's prospects as a mechanic were also secured. The rating scheme used in the school for shop records was also used for designating the degree of success forecasted. In this rating scheme, A signified *excellent;* B, *very good;* C, *good;* D, *fair;* E, *poor;* F, *failure.* This system of letter ratings made necessary certain adjustments in the statistical treatment of the data, as will be explained later, but affected little, if at all, the validity of the results.

Table I gives the data and the statistical treatment involved to determine the coefficient of correlation of general intelligence and mechanical aptitude by the Pearson product-moment method. The coefficient, designated by r, is equal to .52, which is interpreted to signify a marked degree of correspondence.[1] This in itself is worthy of notice, for, whereas it is possible for a person of good general intelligence to be possessed also of a high degree of mechanical aptitude, and vice versa, which is what this coefficient betokens, this is

[1] H. O. Rugg, *Statistical Methods Applied to Education,* Houghton Mifflin Co., N. Y., 1917, p. 256.

TABLE I

CORRELATION TABLE

INTELLIGENCE and MECHANICAL APTITUDE

INTELLIGENCE	MECHANICAL APTITUDE 50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	f	d	fd	fd^2	$x'y'$
160–169					1				1	7	7	49	0
150–159					1				1	6	6	36	+6
140–149					1		2	1	4	5	20	100	+35
130–139			1		1	1	2		5	4	20	80	+12
120–129		1			3	4	4		12	3	36	108	+27
110–119			1	1		4			6	2	12	24	+2
100–109	1	1	3		2	2	3	1	13	1	13	13	−2
90–99			1	2	0	7	6		24	0	$\Sigma = +14$		
80–89		2	1	4	1	2	2		12	−1	−12	12	+6
70–79		2	7	2	5	3			19	−2	−38	76	+38
60–69			3	3	3	1			10	−3	−30	90	+24
50–59			3						3	−4	−12	48	+24
40–49		1		4	1				6	−5	−30	150	+35
30–39		2	2						4	−6	−24	144	+60
f	1	9	22	16	26	25	19	7	$N = 120$		$\Sigma = -146$	930	$\Sigma x'y' = +267$
d	−4	−3	−2	−1	0	1	2	3			$\Sigma = -32$		
fd	−4	−27	−44	−16	$\Sigma = -91$	25	38	6	$\Sigma = 69$	$\Sigma = -22$			
fd^2	16	81	88	16		25	76	18	$\Sigma = 320$				

$$C_y = -\frac{37}{120} = -.27 \qquad \sigma_y = \sqrt{\frac{930}{120} - .0729} = 2.58$$

$$C_x = -\frac{22}{120} = -.18 \qquad \sigma_x = \sqrt{\frac{320}{120} - .0324} = 1.62$$

$$r = \frac{\frac{\Sigma x'y'}{N} - C_x C_y}{\sigma_x \sigma_y}$$

$$= \frac{\frac{267}{120} - (-.18 \times -.27)}{1.62 \times 2.58}$$

$$= \frac{2.23 - (.0486)}{4.1796}$$

$$r = .52$$

$$P.E. = \frac{.6745(1 - r^2)}{\sqrt{N}}$$

$$= .04$$

$$r = .52 \pm .04$$

not the thing one expects to find existing as a general condition. It follows that either the two tests measure the same qualities, or the mechanical aptitudes test is, in reality, rather a test of educability along mechanical lines; those with a high general intelligence learning better and consequently scoring higher than their less well-endowed companions.

tingency coefficient is equal to .73. It is worthy of note, however, that these instructors believed, as is indicated by the correlation of .73, that with some of the boys the trade rating was not an exact index of their chances for a successful trade career. A high trade rating was sometimes accompanied by a rating that indicated that the instructor predicted only a fair de-

TABLE II

COEFFICIENT of CONTINGENCY

INTELLIGENCE and SHOP RECORD

INTELLIGENCE \ SHOP RECORDS	F	E	D	C	B	A	TOTALS
A				2	3	5	10
B			8	9	10	7	34
C+		8	24	19	8	11	70
C	2	3	10	12	4	2	33
C-		1	3	1	2	1	8
D	1						1
TOTALS	3	12	45	43	27	26	156

Column 1 $\frac{1}{3}\left(\frac{4}{33}+\frac{1}{1}\right)$ = .3737

Column 2 $\frac{1}{12}\left(\frac{64}{70}+\frac{9}{33}+\frac{1}{8}\right)$ = .1088

Column 3 $\frac{1}{45}\left(\frac{64}{34}+\frac{576}{70}+\frac{100}{33}+\frac{9}{8}\right)$ = .3166

Column 4 $\frac{1}{43}\left(\frac{4}{10}+\frac{81}{34}+\frac{361}{70}+\frac{1444}{33}+\frac{1}{8}\right)$ = .2890

Column 5 $\frac{1}{27}\left(\frac{9}{10}+\frac{100}{34}+\frac{64}{70}+\frac{16}{33}+\frac{4}{8}\right)$ = .2126

Column 6 $\frac{1}{26}\left(\frac{25}{10}+\frac{49}{34}+\frac{121}{70}+\frac{11}{33}+\frac{1}{8}\right)$ = .1506

P = 1.4513

$C = \sqrt{\frac{P-1}{P}}$ $C = .56 \pm .04$

Table II presents the data and the statistical treatment involved to determine the degree of correlation between the apprentice's general intelligence and shop records. Since the shop records were expressed in terms of a letter-rating system, it was considered best to determine the degree of relationship by the contingency method developed by Professor Karl Pearson[2] for computing correlation when the facts concerned cannot be conveniently measured but can be grouped into classes or categories. In the contingency method, relation is expressed by C, the coefficient of *mean square contingency*. In a sixfold table such as this computation required, C is practically equal to r, the product-moment coefficient of correlation. In this case C equals .56, which is interpreted to signify a marked degree of correlation between general intelligence and shop record. The apprentice with a good general intelligence tends to make a good record at his trade practice. The opposite is also true.

As might have been expected, a high degree of correlation exists between the shop instructors' ratings and the forecasts they make of the apprentices' chances for trade success. According to Table III, item 2, the con-

[2]H. E. Garrett, *Statistics in Psychology and Education*, Longmans, Green & Co., N. Y., 1926, pp. 196 ff.

gree of success for that individual, and so on. Some other factors besides those that determine the degree of success in the school shop are evidently considered by trade instructors as essential for success in the industrial world.

Whatever these other factors may be, general intelligence is evidently not given much weight, for, according to Table III, item 3, the contingency coefficient between general intelligence and the instructors' predictions for success is only .46. There is a noticeable amount of correlation between the two, but compared

TABLE III. List of Contingency Coefficients

Items	*Coefficients*	*Significance*
1. General Intelligence and Shop Record	.56±.04	Markedly Present Relationship
2. Shop Record and Forecast of Success	.73±.03	Very High Relationship
3. General Intelligence and Forecast of Success	.46±.04	Markedly Present Relationship
4. Mechanical Aptitude and Shop Record	,55±.04	Markedly Present Relationship
5. Mechanical Aptitude and Forecast of Success	.44±.05	Markedly Present Relationship

to the correlation of .56 between general intelligence and shop record, general intelligence plays an appreciably greater rôle in the school shop than it does on the job.

The close similarity of effect, amounting practically to identity, of general intelligence and mechanical aptitude is again revealed by items 4 and 5 of Table III, the former showing the contingency coefficient of mechanical aptitude and shop record as .55, the latter showing the correlation between mechanical aptitude and the instructors' predictions as .44. The correlations given for general intelligence in the two preceding measurements were .56 and .46 respectively. Astonishing as these facts are at first sight, they take on an air of reasonableness, in the light of one instructor's explanation, when they were called to his attention. He conceded quite freely that the trade-practice instructors, in making these judgments, might be unconsciously penalizing those apprentices of high general intelligence or marked mechanical aptitude, for he himself considered them as of little value in a trade-school apprentice as compared to ability to follow directions and to profit from instruction. Those individuals who score high in both general intelligence and mechanical aptitudes tests and so, according to Stenquist,[3] are most likely to become the Edisons and Mergenthalers of tomorrow, are apparently not considered particularly good vocational-school material.

These factors — general intelligence, mechanical aptitude, and shop record — are so interwoven in attempting a forecast of success, that much is gained by studying the relation of any two of them with the others held constant or partialled out. This can be done statistically by the method of partial correlation.[4] This device makes it possible to learn, for example, the correlation between the apprentices' shop records and mechanical aptitude, entirely uninfluenced by the indirect effect of general intelligence. Coefficients of partial correlation are written $r12.3$ equals ——whatever might be the result of the calculation. This could be interpreted to read, the correlation between items 1 and 2, with the indirect effect of item 3 partialled out, is equal to —— and so on.

Since the coefficient of partial correlation is figured from product-moment correlation coefficients (in this case, as has been explained, the coefficient of mean-square contingency has been used instead) these are supplied, for reference, in Table IV.

The partial coefficient of correlation between (1) shop record and (2) forecast of success with (3) general intelligence constant is calculated as follows:

$$r12.3 = \frac{r12 - r13\ r23}{\sqrt{1 - r^2 13}\ \sqrt{1 - r^2 23}}$$

TABLE IV. Items Studied, Their Numerical Designation in Finding the Coefficients of Partial Correlation, and the Coefficients of Mean-Square Contingency Previously Calculated

Shop Record is designated by	(1)
Forecast of Success is designated by	(2)
General Intelligence is designated by	(3)
Mechanical Aptitude is designated by	(4)
Forecast of Success is designated by	$r12$
It equals	.73
Correlation between Shop Record and Intelligence is designated by	$r13$
It equals	.56
Correlation between Forecast of Success and Intelligence is designated as	$r23$
It equals	.46
Correlation between Shop Record and Mechanical Aptitude is designated as	$r14$
It equals	.55
Correlation between Forecast of Success and Mechanical Aptitude is designated by	$r24$
It equals	.44

$$= \frac{.73 - .2576}{\sqrt{1 - .56^2}\ \sqrt{1 - .46^2}}$$

$$= \frac{.4724}{.7356}$$

$$r12.3 = .64$$

Compared to the "raw" correlation coefficient, $r12$ equals .73, the partial coefficient of .64 signifies that were every member of the group being studied of the *same degree of general intelligence*, there would be but a slight loss of correspondence between the apprentices' shop records and the instructors' forecast of their success.

The partial coefficient of correlation between (1) shop record and (2) chance of success with (4) mechanical aptitude held constant is calculated from the formula

$$r12.4 = \frac{r12 - r14\ r24}{\sqrt{1 - r^2 14}\ \sqrt{1 - r^2 24}}$$

This gives a partial coefficient of .66 as against the "raw" coefficient of .73, permitting a similar conclusion to the one above, namely, were these apprentices all possessed of the same degree of mechanical aptitude so that this factor might be left entirely out of consideration, the loss in correspondence between their shop records and the forecast made of their chances of success would be immaterial.

The partial coefficient of correlation between (1) shop record and (4) mechanical aptitude with (3) general intelligence partialled out is given by the formula

$$r14.3 = \frac{r14 - r13\ r43}{\sqrt{1 - r^2 13}\ \sqrt{1 - r^2 43}}$$

The solution is $r14.3$ equals .37. Here there is a decided loss of correspondence between shop records and mechanical aptitude once the general intelligence factor

[3] J. L. Stenquist, *Stenquist Mechanical Aptitudes Tests, Manual of Directions*, World Book Company, N. Y.
[4] H. E. Garrett, *op. cit.*, pp. 221 ff.

is held constant, as could not be done when the "raw" coefficient, r equals .55, was calculated. Evidently, then, were every member of the group of the same degree of general intelligence, which is what is expressed by the partial coefficient $r14.3$ equals .37, there would result a decided loss of correspondence between the apprentices' shop records and mechanical aptitude scores.

Practically the same conclusion may be made when (4) mechanical aptitude is substituted for (3) general intelligence and the partial coefficient of correlation between (1) shop record and (3) general intelligence is calculated by the formula

$$r13.4 = \frac{r13 - r14\ r34}{\sqrt{1 - r^2 14}\ \sqrt{1 - r^2 34}}$$

The partial coefficient is .38 as against the "raw" coefficient of .56. There is every reason to believe that either general intelligence and mechanical aptitude are identical, or that the two sets of tests, the army alpha and the Stenquist mechanical aptitudes, measure the same qualities, or as has been mentioned, that the latter test is rather a measure of educability than of aptitude.

As has already been stated, the highest degree of correlation was found to exist between the apprentices' shop records and the forecasts made by their instructors of their chances for trade success. The "raw" coefficient was .73, which is taken to signify a high degree of correlation. The partial coefficient of correlation between (1) shop record and (2) forecast of success with both (3) general intelligence and (4) mechanical aptitude held constant is arrived at by solving the formula

$$r12.34 = \frac{r12.3 - r14.3\ r24.3}{\sqrt{1 - r^2 14.3}\ \sqrt{1 - r^2 24.3}}$$

and is found to equal .60. Evidently, to continue the supposition, were all these apprentices of exactly the same degree of general intelligence and mechanical aptitude, so that these two factors might entirely be left out of consideration in determining the degree of correspondence between their shop records and the forecasts made of their chances of success in the trades, the resulting loss of correspondence would be astonishingly little. The conclusions previously arrived at are reëmphasized. Neither mechanical aptitude nor general intelligence appears to play any great part in the success of the vocational-school apprentice in his trade practice. In the estimation of his instructor, they play an equally insignificant rôle in determining his chance of success in the trade for which he is in training.

Fitting the General Shop to the Small Budget

*D. C. Marshall**

MANY schools in the smaller communities are still limiting their shop course to woodwork because they are frightened by the bugbear of high cost of new equipment, and they are paralyzed by the long lists that are published from time to time as being essential to the teaching of any kind of shop course. The fellow with an almost unlimited spending allowance for equipment likes to tell about what he has bought even though he has so much that he never uses it all. The fellow who has to limit his equipment doesn't tell about it because he does not relish admitting that he is too poor to have more. There is, however, one course that can be introduced into any school where woodwork is taught, which will not cost more than is within the reach of any community. That course may go under several names, but it is usually called the general-shop course.

When it was decided to give the boys of Manhattan, Kans., a little taste of a number of experiences in addition to experiences with wood, it also was found necessary to plan in such a way that the costs would be kept at a minimum. The course was to be given in the eighth grade of the junior high school, and it was to be elective to follow the required course in woodwork offered in the seventh grade. The following kind of work was to find a place in this general course: bell wiring, house wiring, soldering, glass cutting, glazing, lock setting, motor winding, radio, leather craft, metal craft, cold forging, and concrete work.

To keep the equipment costs as low as possible, only enough for two boys in each kind of work was bought, and the schedule was so arranged that only two students would be working on the same kind of work at one time.

A brief summary of the equipment and the cost is as follows:

Bell wiring: 2 bells, 2 buzzers, 4 push buttons, 1 transformer, bell wire, and 2 wiring panels. Cost, $4.

Electric wiring: 2 wiring booths, knobs, tubes, outlet boxes, switches, wall plugs, wire, sockets, and extension cords. Cost, $12.

Soldering: 1 blowtorch, 2 soldering coppers. Cost, $7.

Glass cutting and glazing: 2 window frames, 2 glass cutters, 2 putty knives. Cost, $3.50.

Lock setting: 2 doors, (discarded by the school), 2 sets locks. Cost, $2.

Radio: 2 sets of parts for small radio set. Cost, $10.

Leather craft: 2 tooling tools, 1 leather punch, 1 button setter, small assortment of leather stamps. Cost, $3.50.

*Instructor of Industrial Arts, Junior High School, Manhattan, Kansas.

Motor winding: 2 sets small motor parts. Cost, $3.

Metal craft: 2 pr. shears, several shapes of files, 2 jewelers' saws, 2 blowpipes, 2 alcohol lamps, 2 hammers, buffs, 2 small clamp vises. Cost, $10.

Cold forging: 2 ball-peen hammers, 2 hack saws, 1 cold chisel, 1 drill, small assortment of drills, 1 center punch. Cost, $8.

Concrete work: 1 hoe, 1 shovel, 1 mortar box, 1 sand screen, 2 trowels. Cost, $5.

In addition to the equipment listed in the foregoing, there are some general tools, such as pliers, extra screw drivers, wrenches, and other small tools needed for special jobs. The total cost of this new equipment amounted to about $100. Other equipment, such as concrete molds, metal forming molds, and assortments of punches and stamps are made by the students.

Week	Required Jobs					
	Bell Wiring	Elec.Wiring	Soldering	Lock Setting	Glass Cutting	Motor Winding
1	1 & 2	5 & 6	9 & 10	13 & 14	17 & 18	21 & 22
2	3 & 4	7 & 8	11 & 12	15 & 16	19 & 20	1 & 2
3	5 & 6	9 & 10	13 & 14	17 & 18	21 & 22	3 & 4
4	7 & 8	11 & 12	15 & 16	19 & 20	1 & 2	5 & 6
5	9 & 10	13 & 14	17 & 18	21 & 22	3 & 4	7 & 8
6	11 & 12	15 & 16	19 & 20	1 & 2	5 & 6	9 & 10
7	13 & 14	17 & 18	21 & 22	3 & 4	7 & 8	11 & 12
8	15 & 16	19 & 20	1 & 2	5 & 6	9 & 10	13 & 14
9	17 & 18	21 & 22	3 & 4	7 & 8	11 & 12	15 & 16
10	19 & 20	1 & 2	5 & 6	9 & 10	13 & 14	17 & 18
11	21 & 22	3 & 4	7 & 8	11 & 12	15 & 16	19 & 20

Chart showing the schedule of work for each student with the date on which it is to be started.
Numbers under the name of the job are the numbers of the benches of the students who will work on those jobs on the week whose number appears at the left.

The class schedule is drawn up at the beginning of the semester and is arranged as shown on the accompanying chart. The course covers one semester of eighteen weeks, and the chart shows the required jobs that each student must do and the time at which they are to be performed.

As will be seen from the chart, the boys are allowed one week for each required part of the work. This leaves seven weeks, after all are supposed to have finished the required work, for those who are behind for any reason so that they may have access to the equipment to make up what they need to complete the assignment. The schedule also provides free weeks for each student in which he may elect work in any of the divisions in which work is offered, or in which he may study the related information that accompanies the required jobs.

Assignments are made by job sheets which list the job to be done, the related information on how to do the work, the supplementary reading that is to be done before starting the work, and the questions that the student must be able to answer when he is through. This sheet also has a place for recording the time required to complete the assignment and the grade received on the job.

The boys are encouraged to bring articles from home for repairs and to construct useful articles during the time they are not on the required jobs. These electives include such projects as toasters and other electrical appliances; key cases, bill folds, belts, and other leather articles; concrete benches, bird baths, flower boxes; brass and copper articles, such as book ends, letter knives, and other metal projects. As woodwork is required in the seventh grade before taking this course, the students are not permitted to make wood projects in the general shop except where one or more wood parts are used on some other project.

This system has now been in use for three years, and it has been found to be practical and workable in a small school that has a limited budget.

Arc Welding in Vocational Schools

*C. M. Taylor**

THE ever-increasing use of the electric arc-welding process both in the fabrication of metal designs and in the maintenance of existing metal designs, has given the engineer, designer, and the maintenance man, who has a thorough knowledge of this process, a premium on his services. The use of this process and the advantages it has given to products designed for arc-welded steel construction has caused it to advance so rapidly that today it has not only made a notable impression in industry, but has also drawn the attention of trade and vocational schools to a marked degree.

The establishment of courses in electric arc welding in trade schools was begun only a few years ago in schools conducted as a private enterprise. These schools were designed to give their students, most of whom were already engaged in some trade or industry, an opportunity to gain a further knowledge of that trade or industry, or a knowledge of an allied trade or industry. A good example of this is seen in the development of the modern automobile trade school in which industrial mechanics may gain an intimate knowledge of automotive mechanics. They are thus able to apply an old trade to a new industry, thereby gaining the opportunity of pioneering the new industry and reaping the benefits of high remuneration in a field where demand for skilled labor is great and the supply comparatively small.

And thus it is with welding. From the time this process was established as a definite tool in industry, private trade schools set up courses that would give the skilled laborers of other trades a chance to learn the technique of arc welding and reap the benefits of being able to pioneer the application of this newer and more modern process to an older and more established industry.

Now, however, the teaching of arc welding is no longer confined to private trade schools. Public voca-

*Cleveland, Ohio.

tional and trade schools designed to teach both young and old the rudiments of an established trade and the application of those rudiments in practical work, have recognized the benefits of arc welding. Many have established departments to teach the subject, as a trade, or to give the members of other professions in which arc welding is apt to become a part, sufficient knowledge of the process intelligently to apply it wherever necessary.

The courses of training in different trade or vocational schools may vary in a great variety of ways. In some schools the electric arc-welding process is taught as a separate course and complete instructions are given. In other schools this course is taught as a supplement to another course, such as, perhaps, applied electricity. The method of teaching depends on the time allowed for the course and the amount of work the course is designed to cover. There are probably advantages to both systems, but it seems reasonable to believe that in cases where the arc-welding class is an entirely separate course the time required and the work to be covered will be much greater than in cases where the process is taught as a supplement to an established trade. Figure 1 shows the interior of a shop in which welding is taught. The welders shown in this photograph supply arc-welding current to the booths in which the students practice welding. The portable furnace in the center of the photograph is an example of how arc welding may be used in the construction of equipment for trade schools.

Probably the most important part of a successful arc-welding course is a study of the equipment; that is, the welding machine, electrodes, and the equipment for protection of the operator. The course should cover the various types of all these pieces of equipment, and the advantages of each type. It must be explained, for example, that a welder may be operated in a variety of ways, and that the chief reason for a gasoline-engine-driven welder is to permit the use of this modern process in out-of-the-way places where electric current

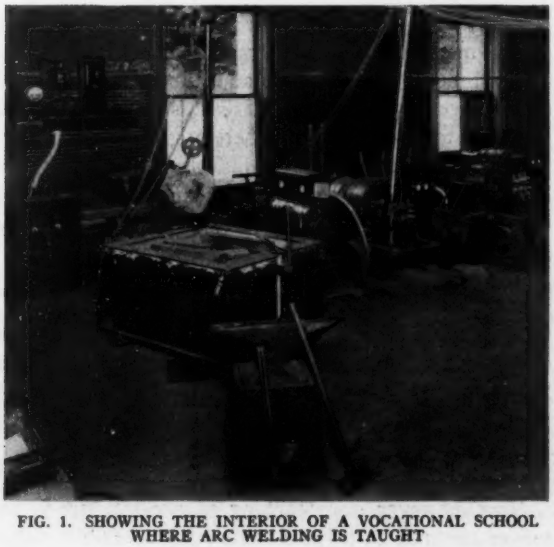


FIG. 1. SHOWING THE INTERIOR OF A VOCATIONAL SCHOOL WHERE ARC WELDING IS TAUGHT

FIG. 2. A MACHINE FOR TESTING WELDS IN A VOCATIONAL SCHOOL

is not available for driving the generator by motor. A student should also be told the differences between a variable-voltage single-operator welder and a constant-potential multiple-operator machine. He must also be told how to regulate the voltage and current on a welder, and why the heat should differ on various thicknesses and kinds of metal. Figure 1 shows a number of modern motor-generator sets for the generation of welding current. This photograph also shows the control board for regulating the welding current.

After the student has been instructed in the operation of the welder and its care, he should be equipped with proper clothing and instructed in the correct way to proceed with the greatest factor of safety. Safety in arc welding consists of protection from the heat and light of the arc and against the burns caused by flying sparks. The heat and light of the arc are injurious to unprotected skin and eyes and the sparks will burn through ordinary clothing, but, contrary to common opinion, there is no danger of electrical shock from a welding current, under ordinary working conditions. The arc should not be struck, nor viewed within a distance of 40 feet without protecting the eyes from its intense light. Safety measures for accidental burns or flashes should also be explained.

After the student operator is properly clothed and instructed in the operation of the welder, he should be taught how to strike and maintain an arc both with the metallic and carbon electrodes. He should also be shown the difference, both in appearances and physical results, between welds made with a short arc and those made with a long arc. No operator can learn how to make good welds by teaching only. Experience and

practice will give him a knowledge of correct welding procedure, and will teach him to know by the appearance of the weld and the sound of the arc, whether or not he is getting good penetration. For this reason a minimum of time should be spent in classroom discussion and lectures. A student should be permitted to practice welding as much as possible — first, on ordinary horizontal beads, then later on the various types of joints, and finally on vertical and overhead welding on the various kinds of joints.

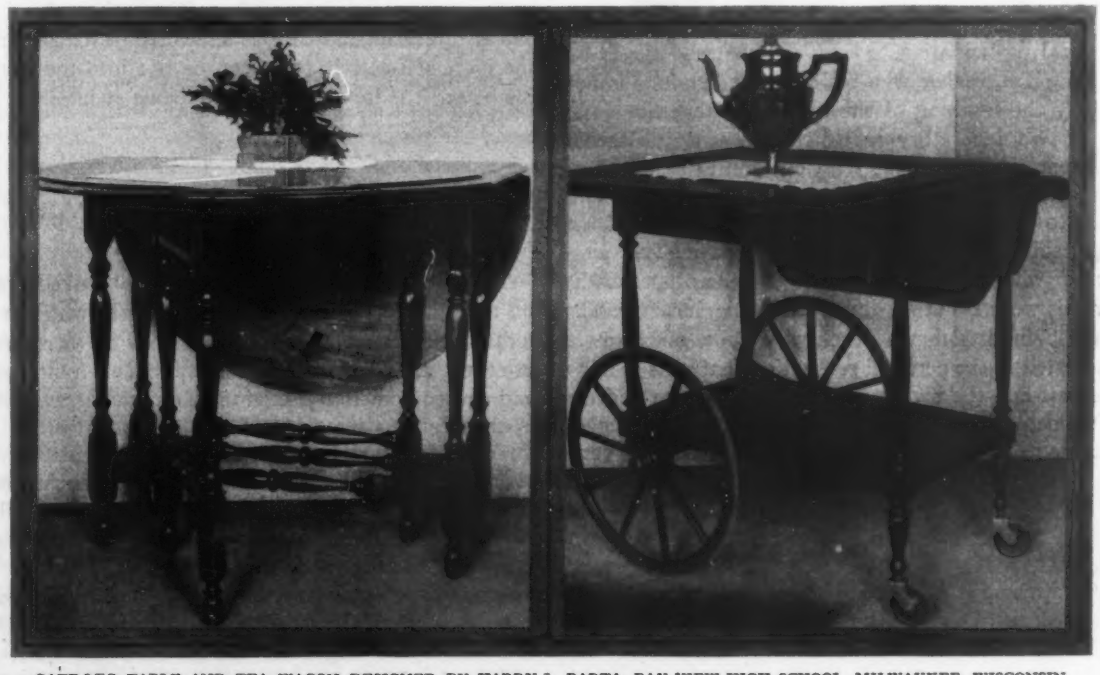
Testing the arc welds made by the student will serve to show him the results of his efforts and wherein he has made his mistakes. These tests should include pulling, breaking and cutting, so as to determine the strength, ductility and penetration of the weld. Figure 2 shows a machine for testing student welds. Behind the machine, on the table, a few of the samples welded by students are shown. The grotesque unit on the table behind the sample illustrates how students secure practice by arc welding scrap pieces of steel together.

Another important result of testing welds made by the students is that it permits a comparison of welded designs and joints. Ordinarily a welded joint is as strong as the members it joins because it fuses the metals into each other, making the entire design one homogenous unit of metal. As with any fabricating work, however, the various types of arc-welded joints and designs have certain particular qualities, and are especially adaptable to certain particular designs, or definite industrial applications. It is only by a series of rigorous tests, however, that these qualities may be clearly shown.

FIG. 3. THIS WORKBENCH WAS MADE BY STUDENTS OF ARC WELDING

Very often in industrial schools it is possible so to guide the training of student operators as to turn their practice into useful channels. This is especially true of students who have nearly completed the course and who are somewhat more adept than the newer students. Very often work can be done for outside firms or individuals, but, as a general rule, any practice time of the student can be well utilized in fabricating articles for use inside the school shop. Figure 3 shows a table built by students of a vocational school using the electric arc-welding process.

Instructors in vocational schools find it profitable to attempt to coöperate with local industrial firms wherever possible, in all types of vocational subjects. This is advantageous from the student's point of view, because it assists him in making contacts which might lead to a position when he has finished his course and because it permits him to see how work is done in factories and under practical conditions. From the manufacturer's point of view it enables him to discover the good qualities of students and very often a valuable man can be developed from a student familiar with a certain trade, and who has secured his primary training in a reliable trade school. This coöperation between manufacturers and the school is the thing that makes the school reliable. It is also a good idea to keep in constant touch with manufacturers of arc-welding equipment for the same reason.



GATE-LEG TABLE AND TEA WAGON DESIGNED BY HARRY L. BARTA, BAY VIEW HIGH SCHOOL, MILWAUKEE, WISCONSIN

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. METZ, Editor

ACTION VERSUS DISCUSSION

Someone has said, "An ounce of demonstration is worth many pounds of discussion." Whether it is permissible or not to look upon demonstrations and discussions as possessing physical weight may be questionable. Harking back to boyhood days, however, will cause one to admit readily that it was easier to learn from a good demonstration than it was to acquire knowledge from a lengthy class discussion.

Every good shop teacher subscribes to this idea, and in his shopwork religiously adheres to this method of teaching. He also knows the value of requiring a maximum of student participation in all shopwork. This "learning by doing" method is no new slogan to the shop teacher. He makes it the backbone of his work.

There are, however, other uses than mere shopwork to which both of these methods may be applied with good results in the school shop. Take the subject of social problems. Time may well be spent on abstract discussion about these problems in the academic classroom. In the shop, however, the teacher has numerous occasions where he can personally demonstrate their application to life situations, and he can also arrange matters so that his students themselves will actually practice them in class; in other words, that they may learn the valuable lesson of solving social problems by personal participation.

The shop teacher who realizes that his duty is not merely the teaching of shopwork, but that his classroom is a laboratory in which many of the actual problems of life may be tried out and experienced, is doing much to raise the level of industrial-arts subjects to the dignity and importance that some of the older subjects seem loath to bestow on it. The question of whether or not the shop gets the proper credit for this work is not the important thing, however. The earnest industrial-arts teacher will be much more interested in the personal realization that he is making the best and the highest use of the classroom and the equipment that is at his disposal in the training of the young lives that have been intrusted to his care.

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THE COUNSELOR'S OPPORTUNITY

Counseling is a most important job and requires a great deal of tact, sympathy, and common sense. Whether the counseling is done by an official counselor or by the shop teacher, the problem remains the same.

There are counselors and *counselors*. One counsels by glibly rattling off facts which are aimed at forming the student's decision. In other words, the decision has been predetermined by the counselor. Another states facts which he or she has gleaned from the reading of numerous books without having had any personal experience or contact with the facts themselves. Still another counselor in a didactic way browbeats the student into a decision without even giving him a semblance of freedom in deciding for himself.

The word "counseling," however, connotes mutual advising, deliberating together, advising after consultation. The counselor, therefore, who is trying to *sell* anything to those whom he counsels is not fully living up to his obligations. It is not his duty to make a decision for the one counseled, but rather he is to aid the latter in arriving at an independent decision.

The official intrusted with this important duty in the school must be fully conversant with the educational, commercial, industrial, and professional information needed to properly discharge this important duty. How else can the student who has not sufficient facts on hand to arrive at the proper decision obtain these facts? The counselor must then be able to weigh the personal qualifications, aptitudes, and inclinations of the one whom he is counseling against the requirements of the professional or vocational opportunity being discussed. Not only must he be adept at this but also skillful and diplomatic in pointing out the probable shortcomings in the personal qualifications.

To further assist the young searcher, the counselor must also be able to avail himself of the aid which the school library, the public library, his personal contacts with men prominent in the profession, the business world and industry are able to render the students whom he is counseling. The entire subject is one of direction, and here as elsewhere in schoolwork, the more self-activity that can be put into the work, the better it is for the one who is being counseled.

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COÖPERATION BETWEEN DEPARTMENTS

The industrial-arts class is frequently looked upon by the other departments of the school in which it is located, as the place where tools may be borrowed, broken things repaired, worn equipment refinished, and new equipment made. If the industrial-arts teacher is an accommodating fellow who is always willing to go out of his way to do something for his fellow teachers, all is well. If he insists that this extra work thrust upon him at odd times interferes with his teaching program, he is looked upon as a grouch, and he is said to be noncoöperative.

There is an old saying, "One good turn deserves another," which still carries quite a bit of meaning. If the industrial-arts teacher should show his spirit of coöperation by taking every job that is given to him,

the other departments ought to reciprocate by helping him to improve his work also.

For instance, the art department might well take upon itself to pass upon the design of the various things made in the industrial-arts department. This does not mean that they should adversely criticize designs after the latter have been executed in wood or metal, but rather when the criticism may still do some good, that is when the design for the piece is being made.

Of course, many art teachers will look upon work of this kind as being somewhat beneath the dignity of one engaged in the teaching of fine arts. Others will say that such design did not form part of the courses that they had to prepare for the teaching of art. Still others will create designs which the ordinary industrial-arts teacher will look upon with suspicion. If the shop teacher, however, has the temerity to voice his doubts, resentment is usually shown, as art teachers do not like to have their designs questioned. They complacently assert that good design is good design, but they fail to give the industrial-arts teacher who is yearning for some rule or rules which can be applied to insure good design, any definite help, because they say "design cannot be brought down to hard-and-fast rules and formulas."

Until, however, art teachers will *coöperate* by giving the shop teacher some rules which he can follow in order to obtain a good design, or unless the art teachers help produce designs that will survive the criticisms of other art teachers, the poor shopman who is not naturally endowed with an artistic sense will be hard pressed to produce work that will be generally acceptable.

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THE TEACHER'S POISE

The old-time reciprocating steam engine was always equipped with a device variously termed the governor or regulator, the duty of which was to keep the speed of the engine as nearly equal as possible, whether the engine was running under full load or no load. This piece of mechanism was exceedingly important, and many engines were wrecked because, by some mischance, the governor did not function when the load was suddenly taken off. Whenever this happens the engine speeds up to such an extent that the centrifugal force disrupts the flywheel, its pieces flying with the speed of cannon balls and carrying destruction, havoc, injury, and death before them.

A shop class is very similar to this type of steam engine. Its students are the component parts which must function smoothly if the work of the class is to be executed in an efficient and effective manner. The teacher is the regulator or governor which coördinates the action of the component parts so that they work properly together.

If the governor on a steam engine is sluggish, or erratic, or highly sensitive, its action is at once noticeable in the behavior of the engine. Likewise, if the teacher is too phlegmatic, excitable, or nervous, the behavior of the class will immediately reflect it.

When a class is especially troublesome, it may be well for the teacher to practice a little introspection to discover whether the fault does not lie with the governing mechanism. A little adjustment of this weight, or that rod, a tightening or loosening of a spring or two, usually is all that is necessary on the governor of a steam engine to make it function properly. Perhaps the human governor, too, will need but a few little adjustments in order to affect his students so that the machinery of the school shop will run more smoothly and harmoniously.

The phlegmatic teacher need but train himself to start the class sharply on time, act a little more alive himself to quickly speed up his class. The excitable and nervous teacher must train himself to judiciously weigh evidence, refrain from snap judgments, keep a firm grip on his temper, and bear himself quietly to produce salutary effects on his students.

Adjustments can be made on the mechanical governor; surely the human governor endowed with reason is not so constituted that he is less efficient and amenable to change than a mechanical device made of steel and bronze.

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THE BUSY SCHOOL SHOP

The school shop is coming to be more and more a 12-month proposition. Vacation time, which to most people means a time for relaxation, is not so construed in an increasing number of these shops because for them vacation time merely means a continuation, for at least a part of each day, of ordinary shop activities. In the larger cities the shops are opened to the students who are attending summer school. In other cities student club activities are fostered during the summer months because it has been found that directed vacation activities are a potent influence in decreasing juvenile delinquency. In still other school shops the industrial-arts teacher is employed by the school board in taking care of work which cannot easily be handled during the school year. Repairs are made; desks, tables, chairs, etc., are refinished; machinery is overhauled or installed; painting, whitewashing, and varnishing is done; new cupboards, cabinets, bulletin boards, etc., are made; and the shop is the central point of emanation for all of this work.

Even where there are no special activities carried on during the summer months the shop is apt to be the source of much concern to either its teacher or to the supervisor under whose charge it is. There are replacements to be taken care of, new equipment to be ordered, and new supplies and new materials to be provided and stored away, all of which keep the school shop from being the dead issue during vacation time that many think it is.

The Qualifications of a Coördinator[1]

*William A. Hemmer**

THE qualifications of a coördinator depend to some extent on the objectives and purposes set up by those in charge of the part-time school in any given community. In the city of Saginaw these objectives and purposes may be stated as follows:

1. To aid the schools of the city in assisting their students to select and to prepare for some definite occupational responsibility, and to become efficient, productive, and constructive workers, and good citizens.

2. To secure, if possible, for these students, the type of position in which they may utilize their abilities to the best possible advantage.

3. To afford the type of employment supervision which will encourage efficiency, full development of abilities, adaptability and stability. By such a program it is hoped to lessen the future number of unemployed and drifters, to reduce social unrest and labor turnover, and to instill in these young people during the formative period of life, proper habits of thoughts regarding their individual responsibility for the welfare of the country.

The search for the best method of securing the proper preparation of the young for occupational life is today attracting increasing interest among progressive business men, demanding more serious attention from educators, and challenging the best thought of public-spirited men.

A Good Coördinator

The first qualification of a good coördinator is to be always on the job, and the second, necessitated by the first, is good health. Other things being equal, one who is endowed with good health and who is constantly on the job is in a position to make use of the endless tact, patience, and sympathy without which, no matter what the educational qualifications may be, a coördinator cannot succeed.

He must be friendly and fair, for children are impressionable and very sensitive, and a thoughtless or impatient comment often makes an impression which lasts a lifetime. Especially do schoolboys and girls hate unfairness. They will do almost anything for the person whom they feel is playing the game with fairness.

As a counselor, the coördinator must have a sympathetic understanding of human nature and experience. This cannot be obtained by study. The coördinator inspired by the spirit of his mission, must find success through rich experience. If he has no sense of humor, he had better get out of the game and let someone else at the job who can handle it with human understanding. He should be careful of his personal habits because these will cause many persons to gain or lose confidence in him. Maturity of judgment, a personality which commands respect, a practical knowledge of psychology, and ability to secure confidential information are also important assets.

He must be able to coöperate with employers and employment managers as well as with the schools in reducing labor turnover. His knowledge of the educational as well as the occupational field must be broad and he must have an intimate knowledge of industry and business in his own community. This means a careful investigation of employment opportunities and conditions under which young people work. On the other hand, he ought to have complete knowledge of every course of study in the various subjects which are taught by the teachers in his school system. He should know the objectives of these courses and be able to discuss them, and decide whether they are being attained. Individual needs must be met and if they are met, children will be glad to come to school and there will be fewer attendance officers and fewer juvenile courts. A good coördinator will need but little help from the attendance officer and will have the hearty coöperation of principals and teachers in the junior and senior high schools.

Criticism is bound to come, but in the face of it he must stand up for the efficiency of the schools. He must meet criticism, he must inform the public of difficulties and he must let the public know what he is doing. The schools are not perfect, neither are other institutions. A coördinator must have the courage and the initiative of the pioneer and must realize the constructive value of mistakes and know how to profit by them. In the modern world he must be a good advertiser and a good salesman. To parents he must sell the value of school instruction, and to employers he must sell not only the value of education but also the services of the boys and girls who have benefited by this education. Outside contacts are an absolute necessity and unless he can make them with success he will suffer a serious handicap.

Truancy

One of the serious problems of a coördinator is that of truancy. This in itself may not be a very serious offense, but it is an indication of tendencies which may later become serious.

The truant is not so very different from other individuals who shirk responsibilities. A good coördinator must get down deep into the cause of these manifestations. Juvenile delinquency is the seed from which adult criminality grows. To trace the adult criminal's development is a post mortem; to watch the juvenile delinquent's progress suggests preventive cure. Be friendly. Do not overdo it. A friendly smile and a show of interest may change a boy's attitude toward school.

[1]Address given before the Michigan Industrial Education Society Convention, Grand Rapids, April 25, 1930.

*Director Part-Time School, Saginaw, Michigan.

Sometimes it is an instructor's fault. There are those under whose instruction even coördinators might feel like being truants. If the boy's interest can be aroused, the battle is won. A good coördinator must meet the issue of truancy squarely, and the more he is able to handle it outside of the probate court the more efficient will his system be.

Responsibility for Results

The part-time schools are held responsible for specific results.

Unlike other schools, the part-time school must justify itself every day of its operation. Employers are discommoded by the absence of their employees while attending school, machines are idle, help is short, production is slowed down, executives are annoyed and in many cases pay is sought for the time away from work; and all in all, the employer has a considerable investment at stake in the part-time school and may be counted on to check up results, whether they be increased occupational efficiency, better character, improved morale or what not. He may be counted on also to act upon his observations in his support or opposition to the part-time work, and in his willingness or unwillingness to employ young people whose working time must be interrupted for school attendance.

The boys and girls themselves will be no less critical than their employers. Every hour must not only be beneficial, but must be recognized as being so, if their interest and good will are to be obtained. Obviously, without this interest and good will little can be accomplished.

The parents and the public will also be heard in regard to the part-time school. Some feel that it is an encroachment upon individual liberties for their children to be obliged to attend, others call it an unnecessary institution, unable to render worth-while services in the limited time required, not a few decry the added burden of taxation it entails; but all are interested in the welfare of the boys and girls, and are willing to support institutions to promote that welfare. The good coördinator, therefore, must be prepared successfully to meet situations as they arise. He must teach, work in his office, read, study, take extension courses, know how his work connects up with other social and educational agencies in his community. In short, if he is to succeed, he must thoroughly know his business, and that means, the business of his community and of that community's part-time school.

Home Mechanics as a Trade-Tryout Course

*A. Raymond Davis**

VOCATIONAL GUIDANCE is that assistance and direction of thought which guides a student in the selection of a permanent vocation in life without the great loss of time and energy that was required by the *trial-and-error* method so commonly employed in the apprenticeship training of the past. A program of vocational guidance precedes apprenticeship training under the present system of education.

Educational institutions all over the country have given a great deal of attention to the subject of home mechanics during the past few years, and millions have been spent in promoting the work of vocational training and guidance. Home mechanics is primarily a guidance subject for those trades which have to do with the home.

Junior high schools and part-time vocational (also called continuation) schools, which have this guidance as their prime motive, have been organized in every city of prominence in the United States and foreign countries. The subjects taught in these schools would be unworthy of their place in the curriculum if their motive were not the discovery of the natural aptitudes of the students and the development of such natural abilities as might fit them for their lifework in a profitable and enjoyable occupation.

The discovery of these aptitudes can best be made through offering a variety of experiences by which the young people may discover for themselves just what their preference is after they have had contact with as many trade activities as possible. Through the experiences thus gained, the student may learn which type of work appeals to him most, and for which he is best prepared by nature.

The junior trade-tryout (home-mechanics) course should be arranged so as to offer these experiences to students early in the exploratory period. The course, in other words, should be prevocational.

No occupation is worth while unless it has its reward in enjoyment and satisfaction, aside from its mercenary worth. To be of much value, vocational guidance must, of course, offer enough experience in several trades to enable the students to make a fair comparison. On the basis of his own experience, then, the student may determine in which of these trades he has the greatest number of assets, such as previous knowledge, experience, and natural inclination.

The title, home mechanics, or household mechanics, is well selected when used with reference to the con-

*Home-Mechanics Department, Manley Junior High School, Chicago, Illinois.

crete application of the training. There are very few trades that do not have something to do with the home. However, the purpose of the course should be of paramount significance in its name, and surely the purpose of this course in the junior high school or the part-time vocational school is that of junior trade tryout. It is presented during the exploratory period of the students' lives when they are receiving their first experiences outside the purely academic training. They are beginning to try out the different trades and to explore the different fields of science and of industry. Their successful experiences will lead them into further pursuit of knowledge in that field.

The result of this tryout will be the awakening of an interest in some particular trade. This interest can be developed further in the trade shops and in the full-time vocational and trade schools.

The vocational-guidance aspect of this subject should be more strongly emphasized in the home-mechanics or junior trade-tryout courses.

Vocational Aviation

*Emory W. Bryan**

AVIATION is making big advances at the present time. There are now more different makes of airplanes than there are automobiles. Of course, not all of those now being built will survive, but out of them will come those which are the most fit to carry on our air transportation.

Statistics on aviation contain surprises for most of those not directly connected with aeronautics. Any article about aviation is news, and is usually given the front page. For this reason we read about every airplane crash in the world from the headlines on the front page of our local paper. Statistics, however, prove that in safety the airplane is second only to the steamship. When once the general public realizes this truth and gets a glimpse of the beauty of the earth from the air, people will no longer want to stay on the ground.

Aviation is a great industry just leaving its infant stage, and which will need a great army of trained workers in the not too distant future. A number of schools have realized this need and have opened courses to meet the demand. As the best positions will go to those who enter this field while the industry is still young, the schools that start their courses first will be able to do the most for their students.

Courses in aviation may specialize on motors, construction, aerodynamics, flying, or any other particular phase of the industry, but any course is not complete or sufficiently enlightening unless it touches on every branch enough to give the student at least a general understanding of the entire field. To be a valuable course in aviation each of the following divisions must be covered at least briefly:

1. Aerodynamics
2. Aircraft construction
3. Aircraft motors
4. Aircraft flying
5. Navigation, Meteorology, Weather
6. Flying regulations

With some time given to these subjects the student may then specialize on any one of them for the remainder of his course.

In giving a course in aviation it should be remembered that there are a variety of jobs to be filled, and that men must be developed for all of them. Following is a list of positions that must be filled in aviation:

A. *Airplane Factories*
   1. Managers
   2. Engineers
   3. Mechanics
   4. Inspectors
   5. Test pilots
   6. Skilled labor

B. *Airports*
   1. Field managers
   2. Pilots
   3. Mechanics
   4. Salesmen
   5. Field labor

C. *Government*
   1. Department of Commerce Inspectors
   2. Army pilots
   3. Army observers
   4. Army mechanics
   5. Army instructors

D. *Aviation Schools*
   1. Managers
   2. Ground instructors
   3. Pilot instructors
   4. Mechanics
   5. Field labor
   6. Publicity men

These are only the basic jobs, and others will develop with the growth of the industry. Aviation will undoubtedly employ as many men as the automotive and radio industries do now.

Vocational aviation in public schools is here to stay, and the schools that get an early start will do the most for their students by inspiring them with something new and worth while.

—⁘—

JUST YOU AND ME

Isn't it strange that princes and kings,
And clowns who caper in sawdust rings,
And the common folks like you and me
Are builders for eternity?
To each is given a bag of tools,
A shapeless mass and a book of rules,
And each must make, ere life has flown,
A stumblingblock or a stepping-stone.

Taken from April–May, 1931, issue of *News-Letter*, published by the National Safety Council.

*Arsenal Technical Schools, Member 113 Observation Squadron, Indiana National Guard.

Carrying Sharp Tools in the Pocket is Dangerous

The boy in the above picture may cut his arm badly on the tool sticking out of his hip pocket.

Many accidents happen yearly because workmen carelessly place sharp tools in their pockets.

© Industrial Arts and Vocational Education

Submitted by Jos. J. Lukowitz, Milwaukee, Wisconsin

Be Careful!

The boy in the above picture was careless. He is suffering for it now.

Like the boy shown kneeling on the floor, he had his face too near the board when the bit broke through.

Keep your face at a safe distance.

© Industrial Arts and Vocational Education

Submitted by Jos. J. Lukowitz, Milwaukee, Wisconsin

PROBLEMS AND PROJECTS

A FORTY-FOUR-INCH SAILING SLOOP

Claude William Horst, Milwaukee Vocational School, Milwaukee, Wisconsin

(See Supplement No. 215)

The model sailing sloop described herewith has been carefully designed, constructed, and tried out. The steps of construction are taken up in the order in which they should be performed. If the directions and plans are carefully followed the work should be very easy. The sliding mast plate makes possible a perfect sailing balance by merely moving the whole sail combination forward or aft as the case may require, without the use of the rudder.

The method of construction presented herewith is somewhat different from that ordinarily used, but it has certain advantages. The hull is made up of two completed halves. Each half is made up of lifts, or layers, which are shaped according to templates shown in Figure 2A. Not until the two halves have been finished, inside and outside, are they glued together with the backbone (consisting of stem and horn timber) in between. This procedure insures an accurate job as the two pieces of each lift can be nailed together, cut out and finished to the line at the same time, making them identical. It simplifies the removal of surplus material from both the inside and the outside. It permits the insertion of an actual backbone of hard wood, which gives the boat a more realistic appearance, and the hardwood stem also stands considerable bumping without chipping off.

The entire boat may be made with hand tools, although a band saw and a disk sander are excellent for cutting out the lifts and for finishing them to the line. White pine is an excellent material for the hull, but if it is not available almost any soft, finely grained wood that is easily worked makes a good substitute. The lifts should be made of slashed-grained material, that is, material in which the grain of the wood

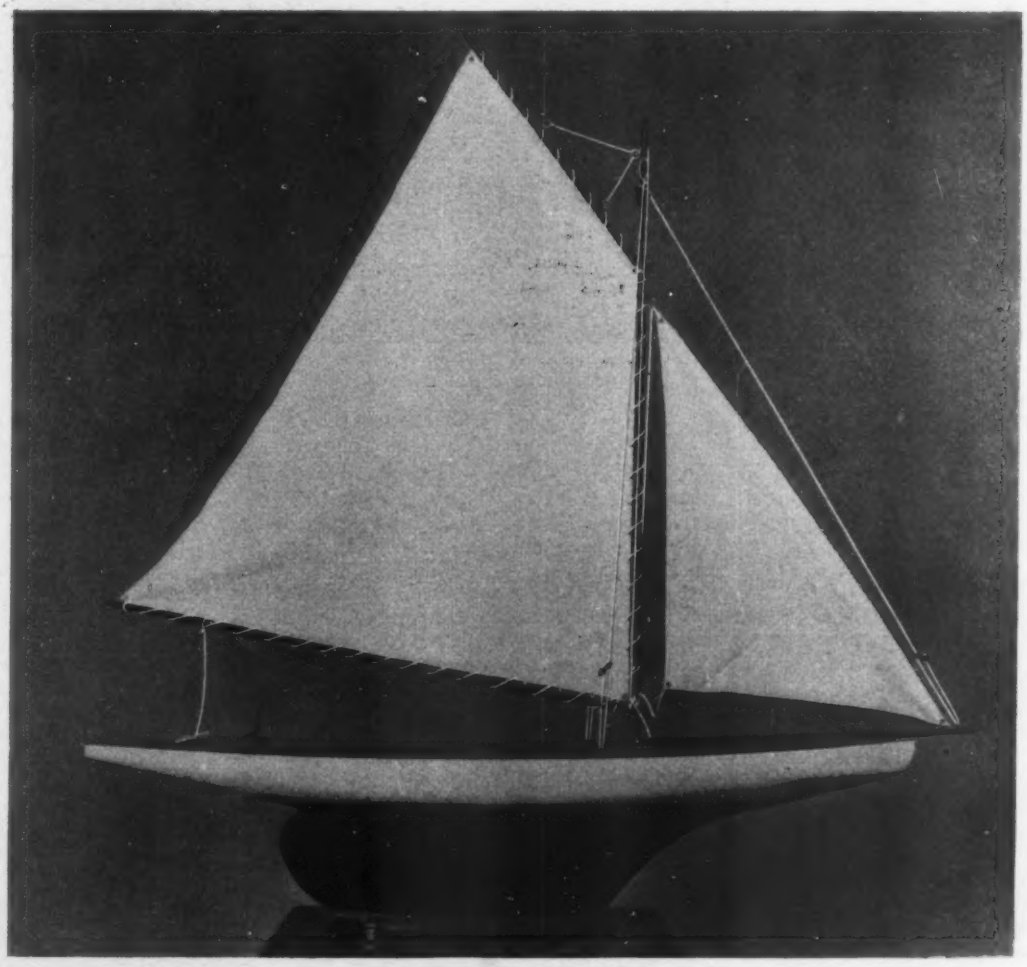

FIG. 1. A 44" SAILING SLOOP

runs as nearly as possible parallel to the top of the lifts. This makes it easier to get a good smooth finish to the hull. All lifts are 1 in. thick and should be cut from material of that thickness.

Lifts 2 to 6 inclusive are each made of two pieces. The length and width of these are taken from the half-breadth plan, Figure 2A. Nail each set together, then mark the exterior and the interior curve of each lift on the proper piece (Fig. 2A). In sawing out the lifts, saw on the outside of the exterior curve and be sure to leave the line for finishing. It is a good practice to cut the inner curve of the upper lifts at least ¼ in. inside of the line given on the drawings and to finish to the line after the lifts have been glued together. Otherwise the pieces are so flexible that it is difficult to get the hull together accurately.

Before gluing together the two halves of the hull, mark accurately according to the drawing, Figure 2B, the angle for the rudder port and drill a very small hole which will later be used as a guide when a larger hole, that gives the proper size for the rudder port, is to be drilled. At that time the angle can again be found merely by pushing a wire through the small hole. This makes possible the accurate placing of the rudder port, which is extremely difficult if left until the entire hull has been assembled.

When assembling the two halves of the hull put glue on the surfaces to be joined and place them upside down on two pieces of 2 by 2-in. material. Line up the halves accurately and fasten them together with 1-in. No. 20 wire brads, the heads of which must be set beneath the surface of the wood and the holes puttied later. Then glue lift 1,

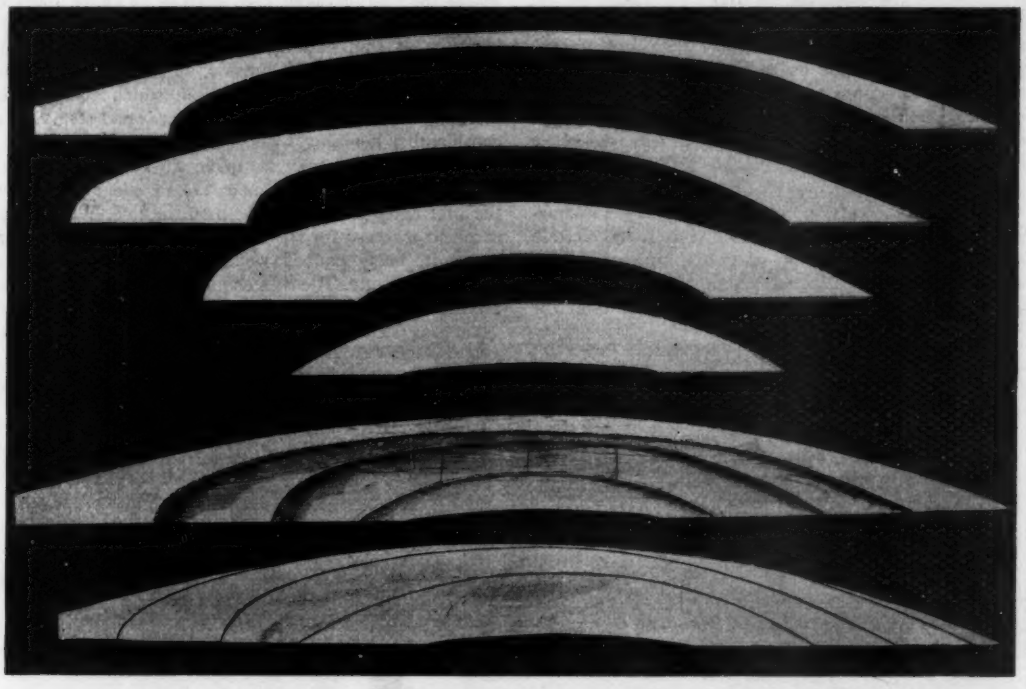

FIG. 5. THE SEPARATE LIFTS. A VIEW LOOKING INTO THE HULL AND ONE LOOKING AT THE OUTSIDE OF THE HULL

After the lifts have been sawed out and finished to the line the two pieces for each set are separated and the pieces for lifts 2, 3, 4, and 5 of each half of the hull are arranged in order for gluing (Fig. 4). Great care must be taken to place the lifts properly for gluing. It will help greatly if the exact position of lifts 2 to 5 is laid out on a large piece of paper, and a full-sized template (Fig. 4) made according to the dimensions given on the profile view, Figure 2B. Heavy cardboard or thin veneer makes good template material. This precaution insures accuracy and is well worth while. Figure 5 shows the interior and exterior of the two glued-up halves in the rough.

The next step is to cut away the surplus material from the outside. In order to get an accurate job, outside templates should be made for the various cross sections, or stations, as shown in Figure 2B, and corresponding marks made on the hull, so that the templates may be fitted at the proper places. After all surplus material has been removed from the outside of both halves of the hull, the surplus is removed from the inside until the shell of the hull is reduced to the desired thinness, which is about ¼ in. Now make the backbone of some kind of hard wood according to Figure 2B, and glue it to either of the two halves of the hull. It must project up more than an inch at the stem and about ⅜ in. at the stern to take care of lift 6, which is still to go on.

which is made all in one piece, in place. When the glue is dry, turn the hull right side up and glue on lift 6. Remove the surplus material from both of these lifts and fair them up with the rest of the hull in the manner already described.

The fin is made according to the detail drawings in Figure 2B. The lead portion may be molded in a number of ways, but a mold of plaster paris or molder's sand is easy to make and serves the purpose very well. The pattern is made according to the lower part of the fin, Figure 2B, and is 1 in. thick, the same as the lifts. About 5 pounds of lead is poured into the mold. After the lead is dressed off to fit the wood part of the fin, it should weigh about 4¾ pounds. The bolts which fasten the entire fin to the hull are made of ¼-in. galvanized rod. They are cut and threaded according to the drawing, Figure 2B, and they must be supported in the mold as shown in Figure 7, before the lead is poured. Care must be taken to place the rods accurately; otherwise difficulty will be encountered when bolting the fin to the hull. In case the hull holes do not quite line up with the rods, make the hull holes larger so the fin may be moved in any direction until it lines up exactly with the hull. Then wrap some cotton smeared with white lead around the top of the bolts, put a washer on each and tighten the nuts. This will usually make the job water-tight. If the drawings have been followed exactly throughout in the construction of the hull, the

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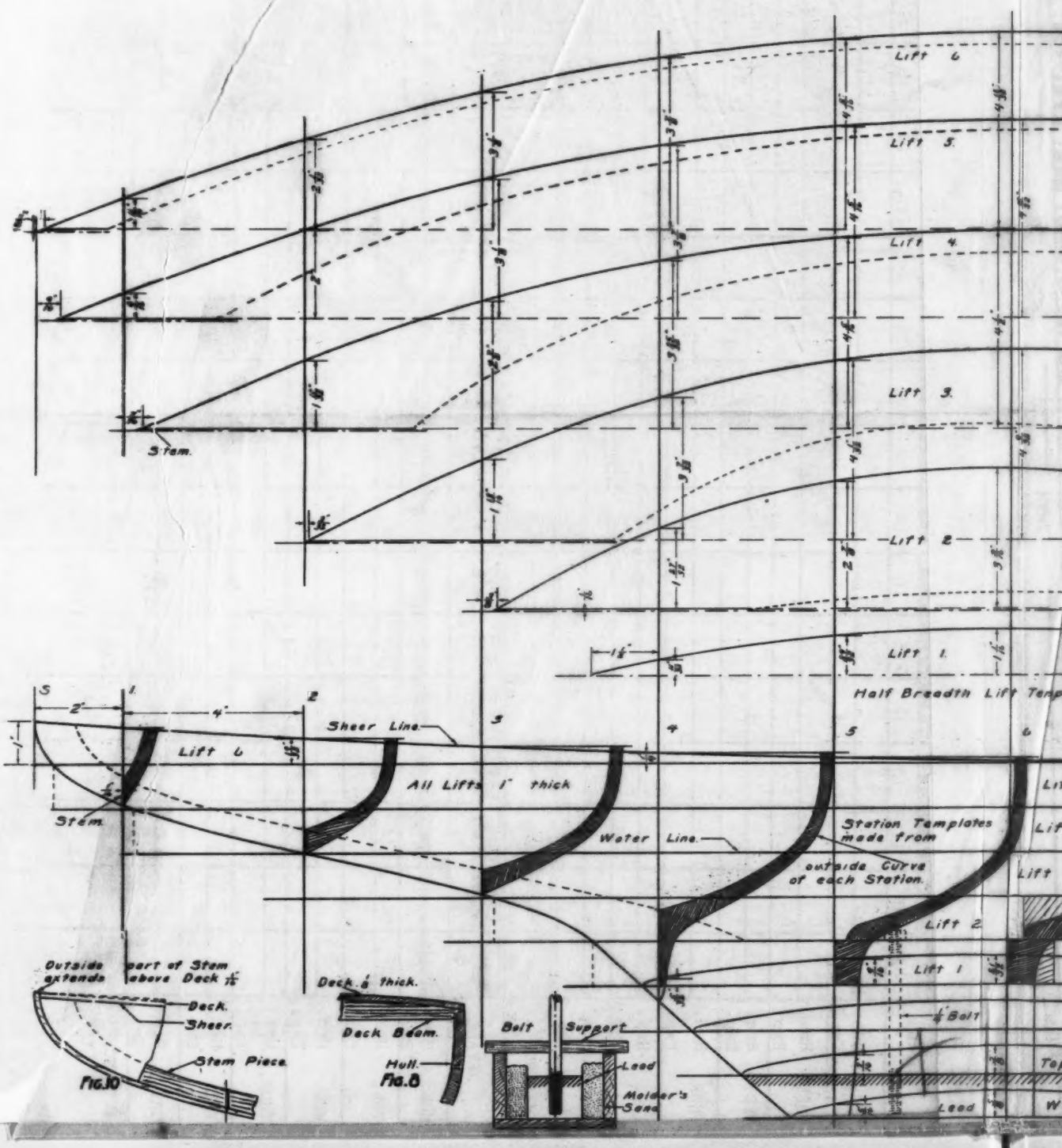

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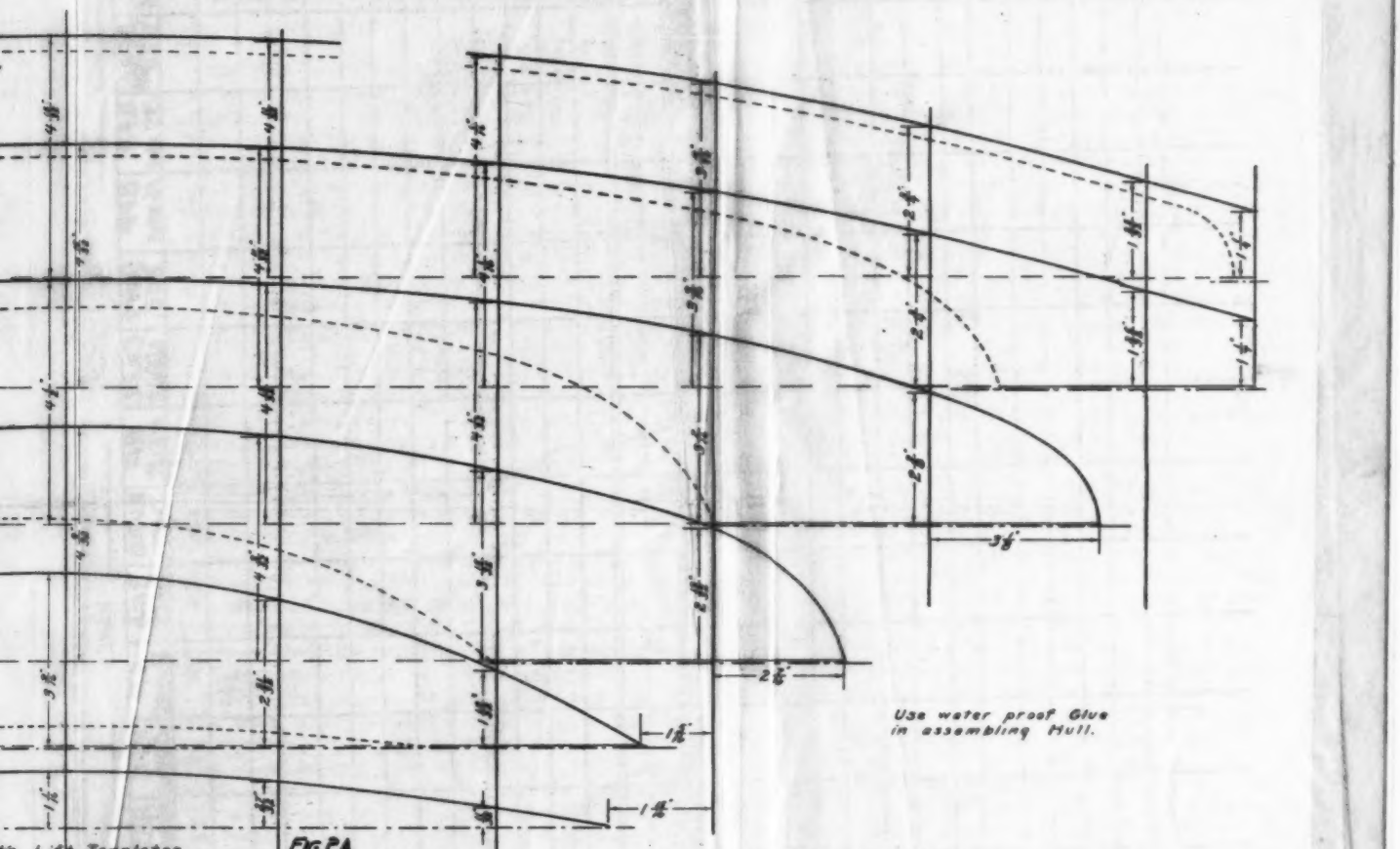
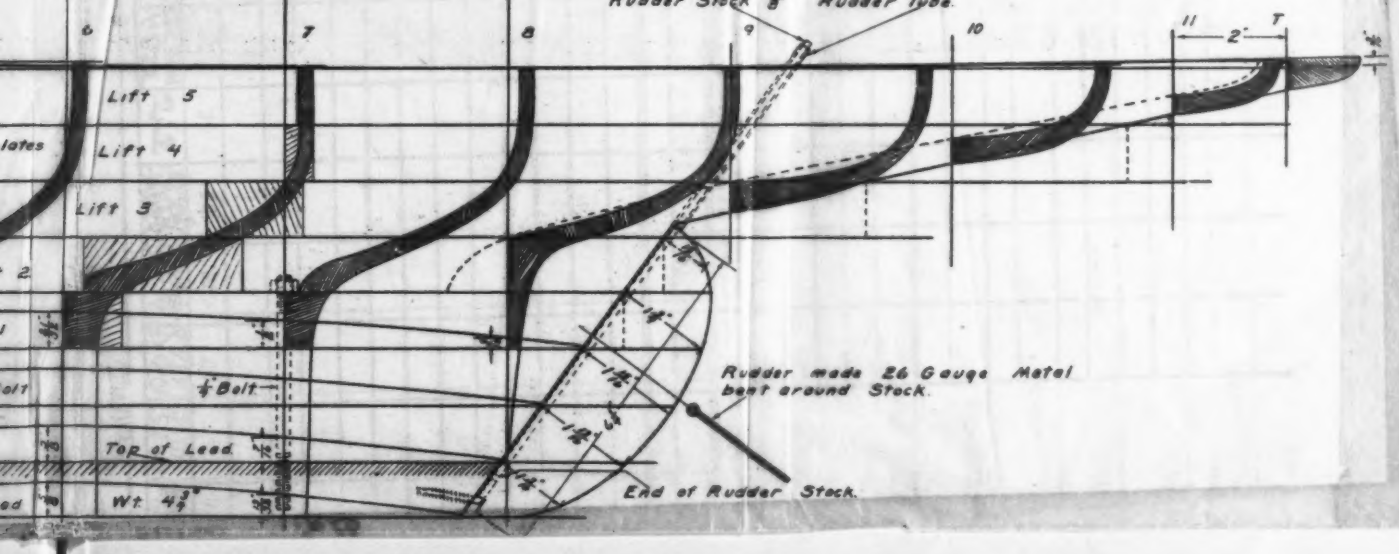
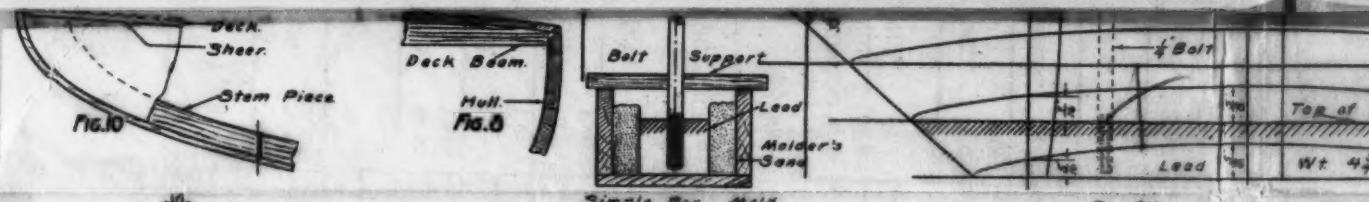
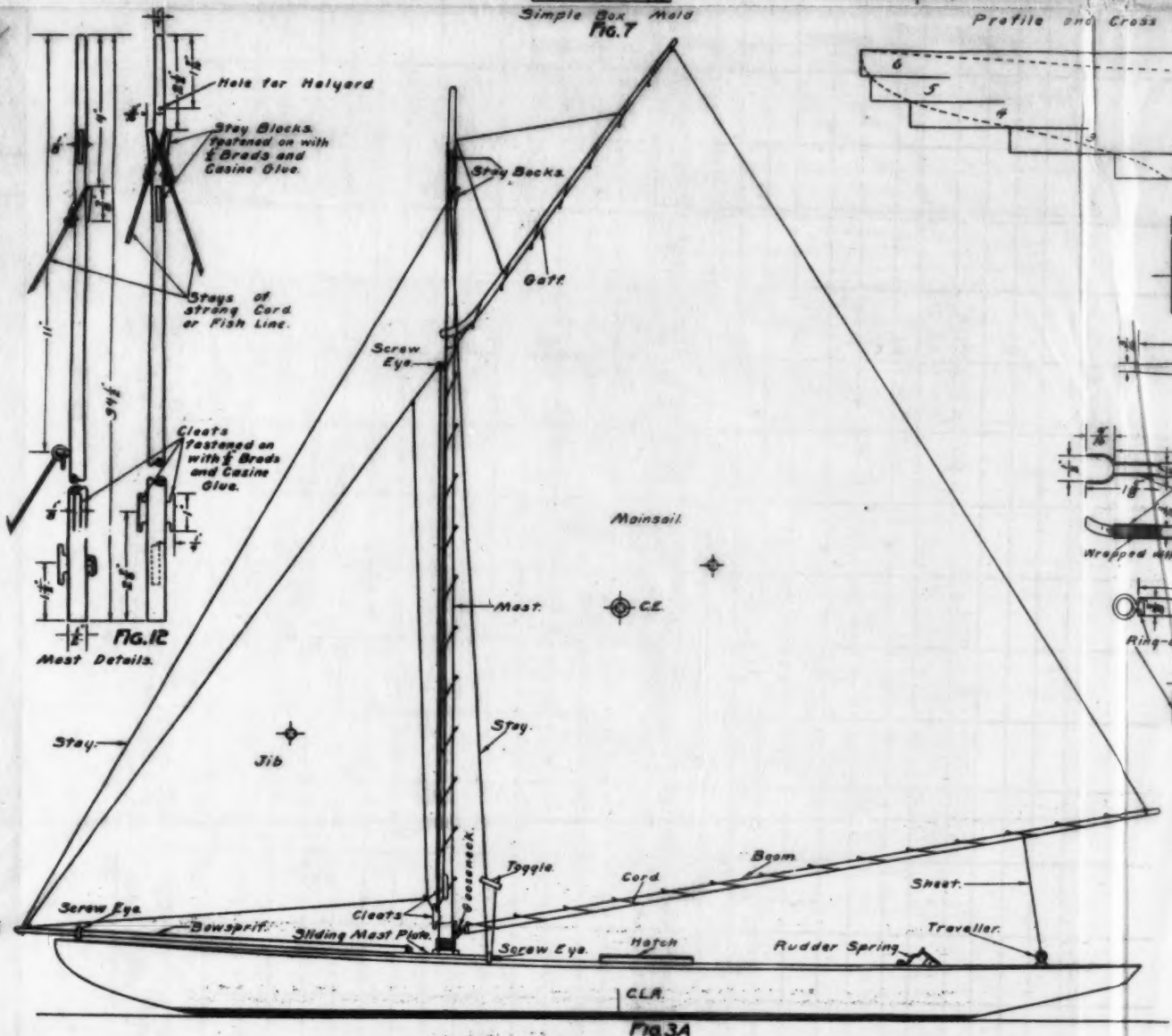


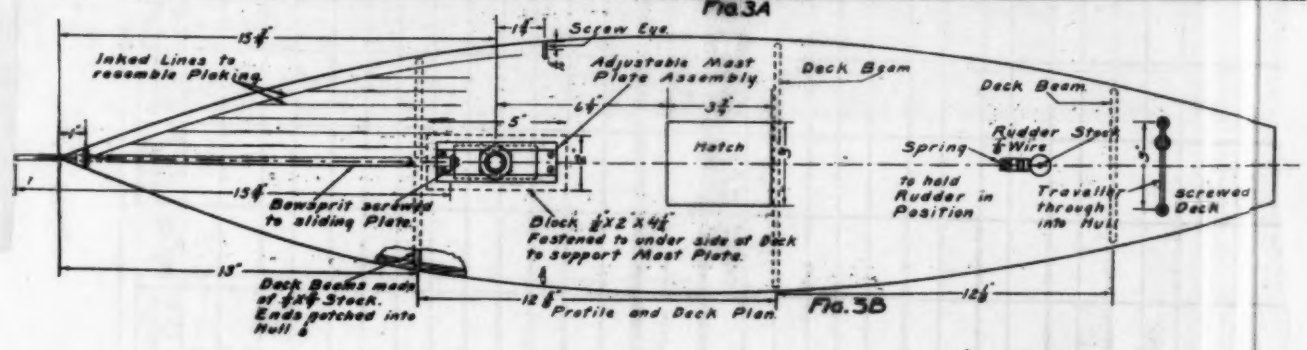
th Lift Templates.

FIG. 2A

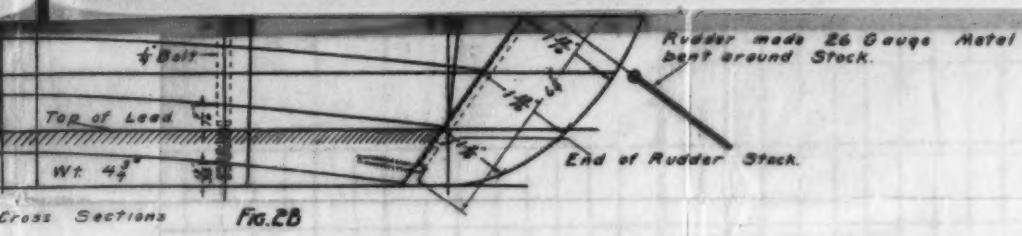








Designed by Claude William Horst, Milwaukee, Wisconsin



Cross Sections Fig. 2B

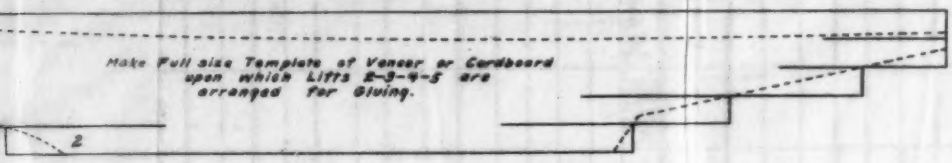


Fig. 4

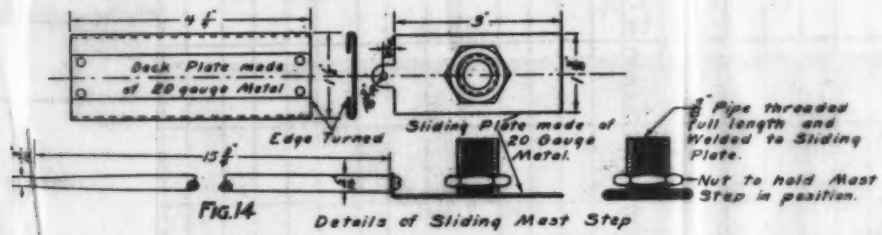

4"
3"
Deck Plate made of 20 gauge Metal
Edge Turned
Sliding Plate made of 20 Gauge Metal.
⅜" Pipe threaded full length and Welded to Sliding Plate.
Nut to hold Mast Step in position.
13½"

Fig. 14 Details of Sliding Mast Step

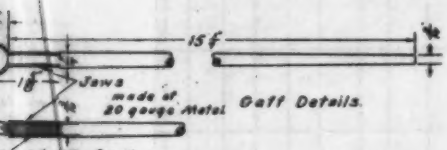


Fig. 13

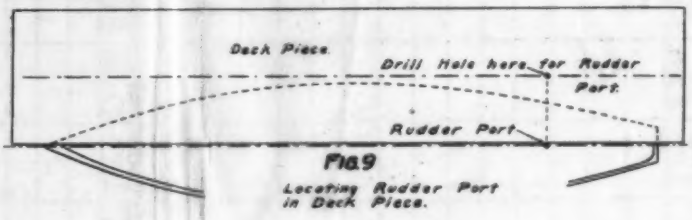


Fig. 9 Locating Rudder Port in Deck Piece.

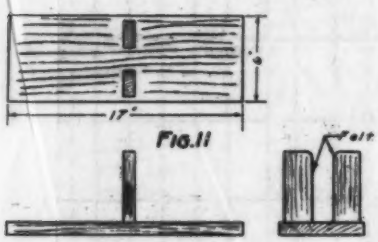


Fig. 11 Stand Suggestions

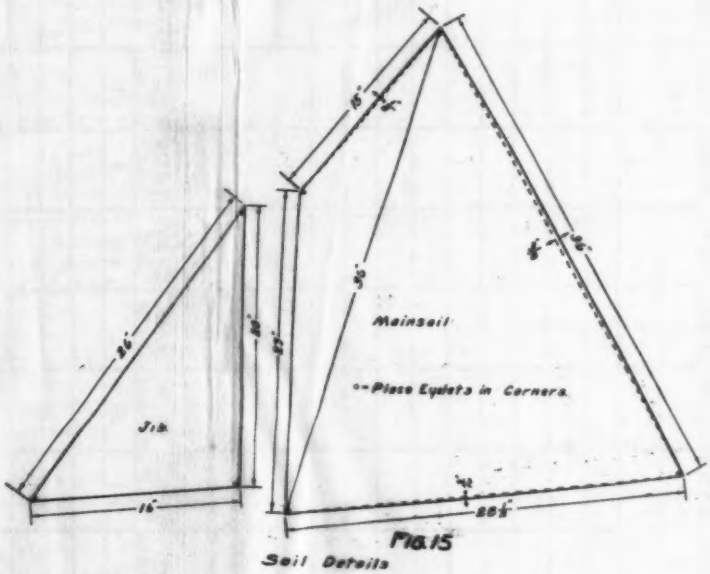


Fig. 15 Sail Details

44" MODEL SAILING SLOOP
DRAUGHT 6"
SAIL AREA 736 Sq. In.

Described Elsewhere in This Issue

underwater body will be submerged just to the water line indicated, but if the hull does float a little heavy at either end, drill holes in the lead at the heavy end until it floats properly, and then plug the holes with wood. The boat must be entirely completed with the sails and rigging in place before it is checked for balance.

the yacht off to best advantage. To give the boat a realistic appearance the underwater body should be painted a different color from the top sides. The combinations which are usual in large ships are topsides white or black; and the underwater body red, green, or brown. The underwater body color should extend about ⅜ in. above the water when the boat

FIG. 6. PARTLY ASSEMBLED HULL

The deck beams, which come next, should be made of ¼ by ¾ in. material, rounded so that the deck will be a little higher in the center than at the edge, as shown in Figure 8. The beams, of which there are three, must be notched into the hull ⅛ in. The rudder tube, made of ⅛-in. tubing (inside measurement), should be put in as soon as the beams are in place (see Fig. 2B).

The deck is made of ⅛-in. mahogany, and a piece several inches longer than the boat should be used. On the piece, draw a center line as in Figure 9. Place the deck piece with one edge against the rudder tube and parallel with the center line of the hull. With a try-square, mark the location of the rudder tube on the center line of the deck piece. Get the angle the tube makes with the deck line (using a T bevel) and drill the deck piece for the tube. Put the deck piece in place with the tube through the hole just drilled, turn the hull upside down and mark the deck, using special care to fit the deck accurately at the stem (see Fig. 10). Remove the deck piece and saw out about ⅛ in. outside of the line all around. Dress off the surplus later when the deck is fastened down.

Before fastening on the deck give the inside of the hull at least two coats of paint, and the underside of the deck two coats of varnish to prevent the absorption of moisture and consequent warping. Fasten a block ½ by 2 by 4½ in. to the underside of the deck with four ½-in. screws as shown in Figure 3B to support the sliding mast plate.

Put the deck in place and fasten down with 1-in. No. 17 wire brads. Dress all around even with the hull, as any overhang tends to interfere with the sailing of the boat. The deck should be completely finished before the rigging is put on to insure a clean-cut job. To give the decks a realistic appearance, draw lines to represent planking, using a ruling pen, india ink, and a straightedge. It is advisable to put a coat of varnish on first as the ink might run and make a messy job.

The rudder is made of 26-gauge galvanized sheet iron, bent around the stock as shown in Figure 2B. After the blade has been properly shaped, solder the aft edge to hold it together. File a notch at the bottom which will rest on the angle hook and serve as a bearing and hinge. The angle hook is simply screwed into the lead as shown. After the whole thing has been accurately fitted, file several notches through the metal in the rudder blade at various places on the front edge, through which the blade will be soldered to the stock. To assemble, place the blade in position on the angle hook, push the stock down through the rudder port into the blade until it almost touches the angle hook, apply solder through the file holes, and the rudder is complete except for the spring device on the deck which holds it in position.

The painting of the outside of the hull requires a great deal of care to get a snappy, clean-cut job which will show

floats. This portion of the underwater color extending above the water is called boot toping, and will be noticed on almost all crafts. The outside of the model should have two coats of flat white paint before the finishing coats are applied. To insure a smooth finish each coat must be sanded down before the next is applied. When putting on the finishing coats begin with the topsides and put the underwater body paint on last after the topsides are thoroughly dry. This will prevent the topsides paint from running over the boot toping.

As soon as the hull is finished, a stand such as shown in Figure 11 should be made to hold it in an upright position. A boat supported in such a stand takes up less room and will be in less danger of damage to the sails and the rigging. As a rule, it is advisable to take the stand along whenever the boat is to be sailed.

When the hull is entirely finished the rigging is made. The spars (mast, bowsprit, boom, and gaff) shown in Figures 12 and 13 may be made of straight-grained spruce, which is light, tough, and elastic. The sliding mast step, shown in Figure 14, is made by brazing a piece of ⅜-in. threaded, brass pipe to a piece of 20-gauge brass. The step, in turn, slides in a second piece of 20-gauge brass with bent-over edges which is screwed to the deck and into the block already mentioned. The mast tube is held in position by screwing down the nut. The sail traveler, shown in Figure 3B, is made of No. 12 wire bent to shape, and screwed through the deck into the hull proper. Halyards and stays may be made of fish line, or other strong cord.

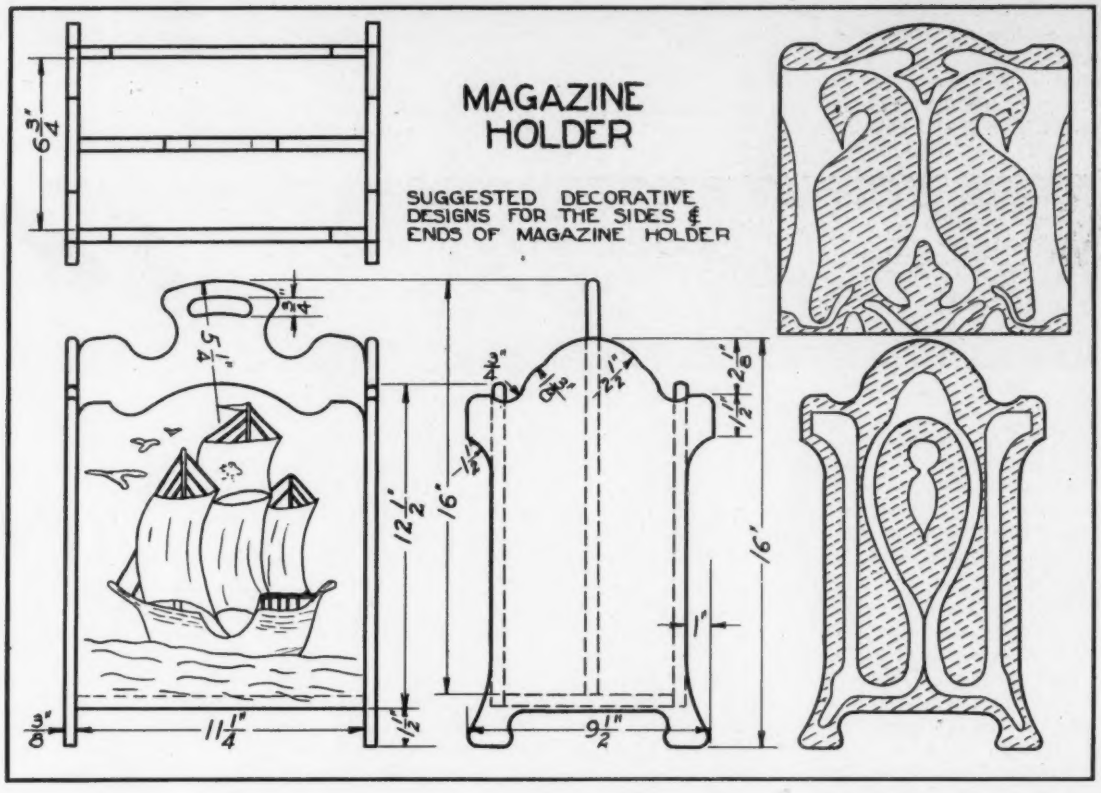
Sails may be made of several different kinds of material. Longcloth makes excellent sails. When cotton cloth is used it must be shrunk first by wrapping it up in a wet towel or other heavy cloth for an hour or so. It must then be pressed with a hot iron until it is dry and until all its wrinkles are smoothed out. When cutting out the sails, sufficient material must be allowed for the hem. If the sewing is done on a sewing machine a neat job is much more likely to result. The dimensions of the sails are given in Figure 15. The sails are laced to the spars with a light, strong cord. The holes in the sails for the cord are made with a heavy needle. Cutting holes should be avoided. All corners should have eyelets which any shoemaker will put in for a small sum.

MAGAZINE HOLDER

A. J. La Berge, Bryant Junior High School, Minneapolis, Minnesota

The magazine holder makes a very appropriate gift for mother and is surely a problem that has a very practical use in the home. There is an ever-increasing interest being shown by boys in colorful articles, such as the magazine holder illustrated in the accompanying drawing.

The illustration shows the shaping and the construction details. However, it is suggested that individual patterns of



the different parts of the project be cut out of heavy paper or cardboard. These parts may then be traced on the stock to be used.

A three-ply plywood is suggested for the material to be used in the construction of the magazine holder. Any soft wood will do very nicely, if a lacquer finish is to be applied.

Bill of Material

2 pc.	3 ply	x 9½ x 16	Ends
2 pc.	3 ply	x 11¼ x 12½	Sides
1 pc.	3 ply	x 11¼ x 16	Center
1 pc.	½	x 7 x 11¼	Bottom (pine)

After tracing the patterns on the stock, cut carefully to the line with a coping saw or a jig saw. Use a spokeshave, wood file, and sandpaper to get the edges smooth.

Assembling: Sandpaper all parts thoroughly before assembling, using No. ½ and No. 2/0 sandpaper.

Use 1¼-in. wire brads and glue in assembling the magazine holder. It is a good plan to use glue on the brads when nailing into plywood.

Finishing: A very suitable finish which is most popular at present is lacquer. It is obtainable in a great variety of colors and shades. There are many brands of brushing lacquer now on the market, and good results may be obtained with most of them.

First, give the project a thin coat of shellac, and sand with No. 4/0 sandpaper when dry. Lacquer should then be applied with a good quality fitch-hair brush or a camel's-hair brush. It must be brushed in one direction only.

Two coats are usually enough when applied over a surface that has been treated with shellac. The last coat should be allowed to dry several hours before being sanded with No. 4/0 sandpaper. Sand in one direction or with the grain only. The surface may be finally polished with rottenstone and oil. If a dull effect is not desired, the final sanding and rubbing may be omitted.

Transfer or stencil patterns of brilliant contrasting colors may be used to decorate the ends and sides of the problem. *Tempera* may also be used successfully for this purpose. It requires more time and care in its application, however. The use of two tones of the same color is a common practice.

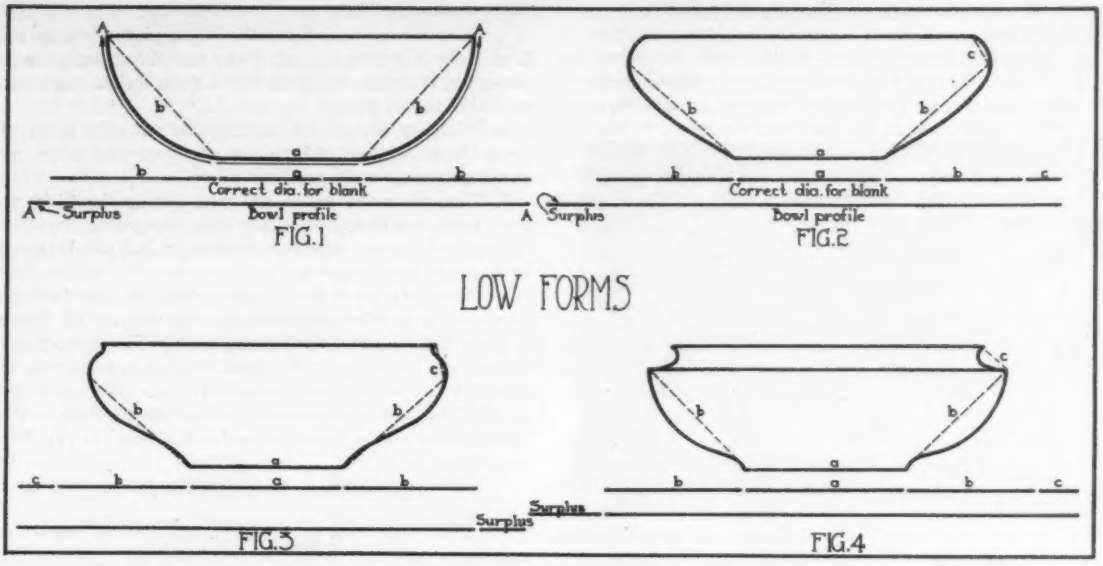
Suggested designs are offered in the illustration. These are worked out on paper first and then traced on to the sides or ends of the project. It is well to apply one or two coats of shellac or one good coat of varnish to the magazine holder as soon as the tempera is dried. Tempera may be obtained in small glass containers in different colors and shades ready for use.

ESTIMATING THE BLANK REQUIRED FOR HOLLOWWARE

Louis J. Haas, Director of Men's Therapeutic Occupations, Bloomingdale Hospital, White Plains, New York

Every student of art metal work and every craftsman interested in producing beautiful pieces of hollowware knows how essential it is to properly estimate the size of the disk from which the bowl, vase, or cup is to be constructed. The designing of the form is the *first* of three steps that bring into existence an object, which though made of cold metal, may reflect the sincerity and personal charm of the craftsman creator. Estimating the pattern from which the disk of metal is cut is the *second* step, and the raising, planishing and finishing of the form is the *third* and last step in the production of the piece.

Every handmade piece of hollowware passes through these three steps or stages in the process of coming into existence. All are important and essential to the production of a harmonious and satisfying form. While this is true, yet the craftsman is aware that more thought has been given to the study, development, and control of the first and third steps than to the second. It is difficult to see why this should be, as the estimating of the pattern is the essential connecting step that carries the design over to the construction stage and into being. If the pattern is not properly developed, the design is not realized in material.



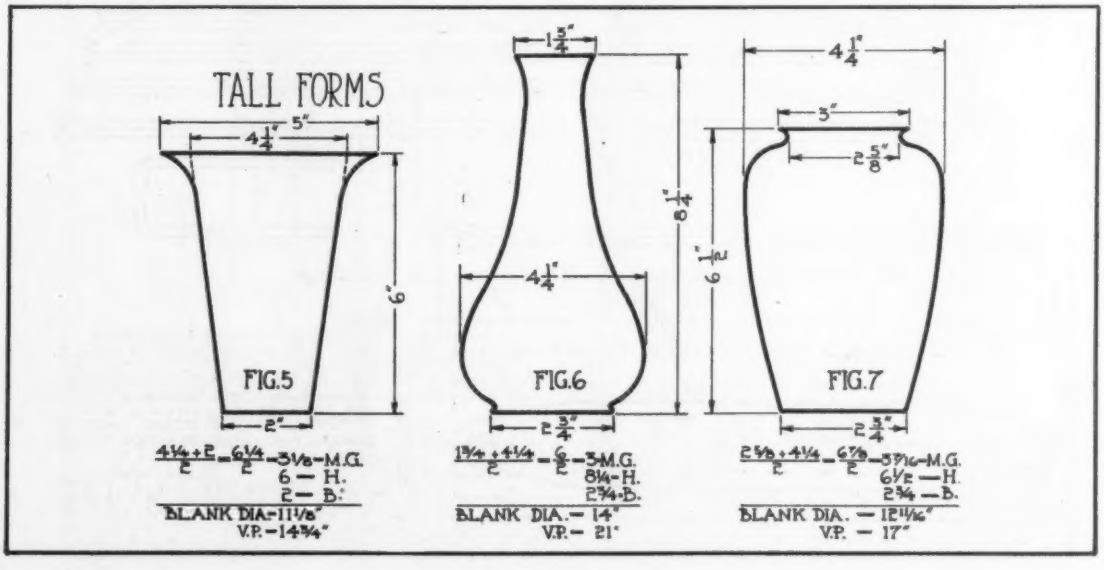
Every craftsman who has constructed or raised a bowl or vase form knows how discouraging it is when well along in the construction stage, to discover that the original piece of metal was too small to produce the piece as designed. He also knows how disheartening it is to discover, after much work has been done, that the blank had been overestimated and is much larger than needed. When the latter occurs, much time and effort is wasted, as the surplus metal must in the end be trimmed off and cast aside as waste. Usually the metal that must be thus discarded consumes as much time and effort as the remaining portion or the complete piece.

The worker has nothing but experience to guide him in estimating the pattern, and singularly no one has organized and formulated this so that it can be passed on and used with precision by the student. The only formula given the student reads as follows: Measure the contour or profile of the bowl from lip round the bottom to lip or from (A) to (A) as shown on Figure 1, and use this as the diameter of the disk. For a simple low form this gives a disk nearly the right size. The worker quickly learns, however, that this disk is slightly larger than needed, and that when this crude method is applied to deeper bowls and vase forms the resulting patterns are very much oversized.

Careful comparison of the designs, blank disks, and recorded amounts of under- or overestimated diameters of many types of bowls, cups, and vases has produced the carefully tried and tested formulas illustrated in Figures 2, 3, 4, 5, 6, and 7. It was found that because of the different categories of shapes, no one formula could be found which would satisfactorily answer for all cases. By forming two classes into which all forms to be estimated could be placed — that is, low and tall forms — a formula was developed for each class that tested to a satisfactory degree of accuracy.

The formula for all low or bowl forms, may be stated thus: To the diameter of the base *a* add both the chords *b* which is the shortest distance from circumference of bottom to girth of bowl; to this add only one of the two chords *c* which is the shortest distance from the girth to the lip of the bowl. This total is the diameter of the blank from which the bowl is raised. This formula is easily applied to all bowls or low hollowware forms and patterns estimated in this manner produce the designed piece without waste.

For tall forms the formula may be stated thus: To the mean girth add the height plus the diameter of the base to determine the diameter of the blank. To find the mean girth, take the



sum of the diameter at top or lip plus the diameter at girth and divide by 2.

By comparing the diameter of the blank as shown in Figures 1, 2, 3, and 4, with the bowl profile shown in these same figures, it will be seen how much waste both in material and time is eliminated. In the tall forms as shown in Figures 5, 6, and 7, the difference between the diameter of disk given by formula and that given by the unmodified vase profile (V.P.) is quite marked and shows the wide margin of error possible under the older method.

TROUSER HANGER

W. R. Challoner, Appleton, Wisconsin

This is just a simple problem for general metal or machine-shop work that the boy can use himself, if he wears long trousers. The hanger will accommodate five trousers and is intended to be fastened to the closet door or any other convenient place.

It consists of five bars made of ⅛ by ½ by 24-in. cold-rolled steel. The following process sheet may be used for the job.

1. The ends of each bar should be laid out with a ¼-in radius, ground or filed to the line, and the edge rounded same as the edge on the stock.

2. Bend a slight curve on both ends of each bar so that the ends turn in the same direction.

3. Lay out the center line on the bar on the side that bends.

4. If hard, cold-rolled steel is used, it is well to heat the bar red-hot in the center where the eye is formed, so that it will bend more readily. This operation offers an opportunity to explain the effect of heat in the annealing of steel. The student also has an opportunity to prove for himself that heat makes a bar of hard material easier to operate on, by trying to bend one bar without this annealing and the rest after they are annealed.

5. Place the bar in a vise with a short piece of ¼-in. round steel about 3 in. long in such a way that the ¼-in. piece is on the center line, then bend the bar to form a right-angle corner over this round piece.

6. Bring the ends of the bar together with the hands, then press them together with the vise, keeping the ¼-in. round piece in place.

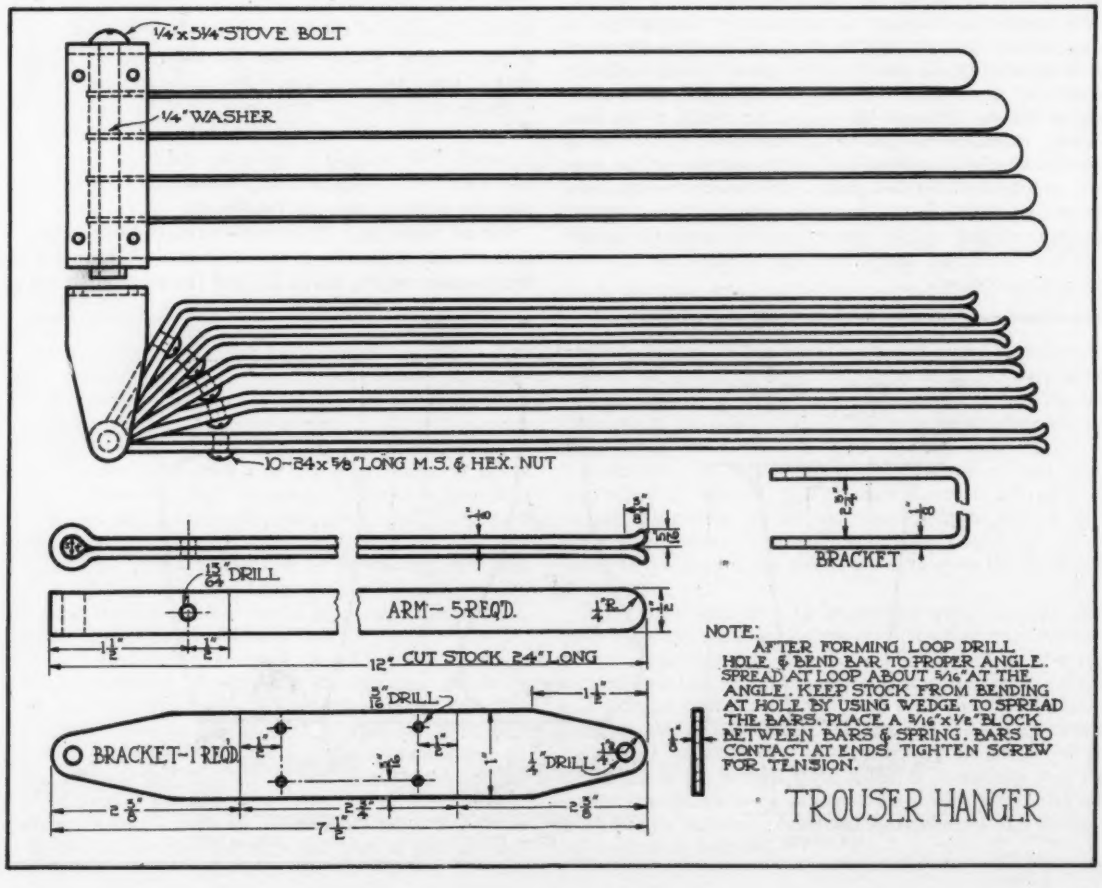
7. Then place the bar in the vise, letting the ¼-in. piece rest across the vise jaw. Strike with a hammer. The end of the bar will spread somewhat, but the round piece will come back to its original place.

8. Place both pieces in the vise so that the round piece will be about ¼ in. above the vise jaw, and tighten the vise until it grips the round piece. Still tightening the vise, strike the bar with a hammer, at the same time closing the vise until a complete eye has been formed. If the ¼-in. piece is not raised above the vise jaw as suggested above, there is a possibility that you may cut your stock or bar in two in this operation.

9. Lay out and drill a hole, also lay out bending line for the degree bend.

10. Bend four bars, one 15 deg., one 30 deg., one 45 deg., and one 60 deg.

11. It is important that these bars be spread at the eye so as to leave an opening between the two bars of about 3/16 in. at the bending point. At the same time, the end of the bars should come in contact with each other. In this way pressure will be distributed all along the bar when the trousers are in place. To get this operation done nicely, make a wedge piece about 5/16 in. by ½ in. wide and force it between the bars just back of the bending line toward the eye. Then spring the ends of the bar together so that when wedge is removed the bar will come in contact at the ends. There should be


¼"x 3¼" STOVE BOLT
¼" WASHER
10-24 x ⅝" LONG M.S. & HEX. NUT
BRACKET
15/64" DRILL
ARM — 5 REQ'D.
12" CUT STOCK 24" LONG
BRACKET-1 REQ'D.
NOTE:
AFTER FORMING LOOP DRILL HOLE & BEND BAR TO PROPER ANGLE. SPREAD AT LOOP ABOUT 5/16" AT THE ANGLE. KEEP STOCK FROM BENDING AT HOLE BY USING WEDGE TO SPREAD THE BARS. PLACE A 5/16" x ½" BLOCK BETWEEN BARS & SPRING. BARS TO CONTACT AT ENDS. TIGHTEN SCREW FOR TENSION.
TROUSER HANGER

about a 3/16-in. opening between the bars at the bending point as suggested before.

By tightening the 10 by 24 machine screw, tension on the bars can be controlled. For making this adjustment, place a piece of wood ⅛ in. thick between the bars, and adjust until the pressure is exerted evenly all along the piece. This will then insure an even pressure along the trousers when they are in place. After this adjusting has been done, the bars are ready for assembly.

The bracket is a simple layout and forming job, and should require no further explanation.

After assembly, place a piece of wood about the size of a match between the bars to keep them apart, and give the bars a coat of clear lacquer. This will keep them from rusting. That part of the hanger back of the bending point on the bar should be painted or lacquered black, as this somewhat covers up marks and bruises caused in the forming operations.

This problem makes a very fine metal-working job, and results in the most convenient trouser hanger that the writer has ever used.

REVOLVING SPOOL HOLDER

J. M. Ebbert, Supervisor of Manual Training, York, Pennsylvania

An interesting shop project, requiring a small amount of material but involving a large number and variety of processes and experiences, is the revolving spool holder.

It is a project into which the student may inject much originality and initiative as to design, color, etc. A pincushion may be placed on the center of the top, and lamb skewers may be used for pins to hold the spools.

Painted in colors to suit the taste of the individual, it becomes an attractive project.

ORNAMENTAL CONCRETE

William L. Hunter, Associate Professor of Industrial Arts, Iowa State College, Ames, Iowa

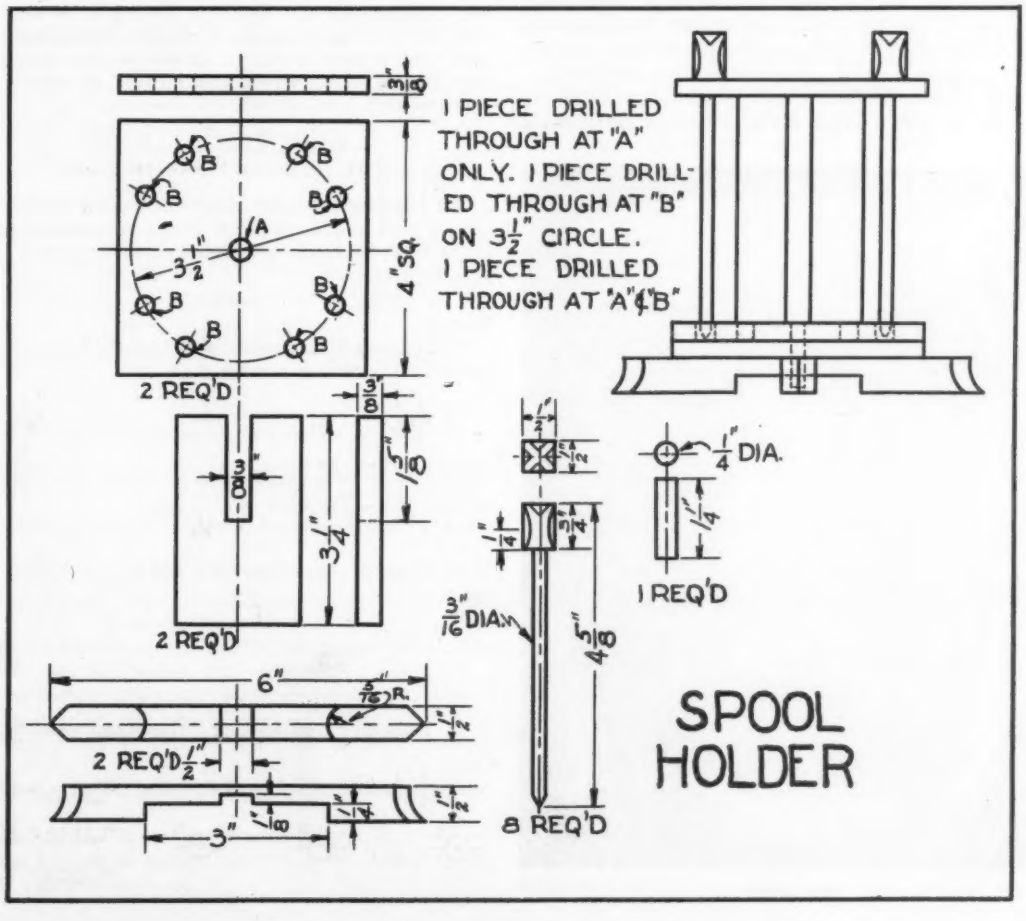
During 1931 the people of the United States will use on the average nearly two barrels of Portland cement for each

ORNAMENTAL FLOWER BOX

of its inhabitants.[1] Such an extensive use of cement in the making of concrete demands that our future citizens be educated to prepare and use the material intelligently.

Some industrial-arts teachers object to concrete as an educational medium. They say that it is too dirty or they maintain that the boy can make few useful things of it, consequently the boy has no interest in it.

[1]From U. S. Geological Survey and U. S. Bureau of Mines, *Cement and Concrete*. Published by Portland Cement Association, Chicago.


1 PIECE DRILLED THROUGH AT "A" ONLY. 1 PIECE DRILLED THROUGH AT "B" ON 3½" CIRCLE. 1 PIECE DRILLED THROUGH AT "A" & "B"
2 REQ'D
4" SQ.
1 REQ'D
8 REQ'D
SPOOL HOLDER

The experience of the writer leads him to believe that concrete can be made one of the most worth while of shop courses. Anyone who thinks that there is nothing to concrete work should try his hand at it. Especially is this true in the making of ornamental concrete projects.

A few of the experiences of the writer in ornamental concrete work may be of help to others who decide to introduce it into their industrial-arts courses.

1. Ornamental concrete articles should be made in ready-made metal forms. Homemade wooden forms are discouraging to even the best pupils. Wooden forms swell, warp, draw water out of the concrete, and otherwise behave in ways that cannot be predicted. Iron forms on the contrary do not warp. They may be used indefinitely, and they make possible the production of articles which are really pleasing and desirable for home use.

2. The materials and mix which one uses are of tremendous importance in the making of good concrete. Sharp, clean sand is absolutely necessary. If the concrete seems to crumble easily after it has had time to harden, one of the first things to examine is the sand which has been used. A good way to do is to try three or four different kinds of sand in order to determine which produces best results. Some sand absorbs water and soaks it out of the concrete thus leaving the mixture without the necessary moisture for proper setting and hardening.

a) The amount of water which one uses is very important. For ornamental concrete where iron forms are used, just enough water should be added so that there is the faintest trace of water when the mixture has been troweled heavily. No water should run out of the forms, no matter how heavy the mixture is tamped in the forms.

b) The amount of cement which is used will vary with the character of the sand, but it is generally safe to use about 1 part of cement to 2½ parts of sand. For school use the quick-hardening Portland cement is much better than the ordinary cement.

3. The concrete should be well tamped into the forms. For flat articles like lawn-bench tops a heavy wooden mallet makes a good tamper. For tall objects such as bird-bath pedestals a discarded broomstick serves very well. Special care must be taken to tamp the concrete into floral designs and places which are undercut.

BIRD BATH

ORNAMENTAL FLOWER BOX

4. After the concrete has set from 12 to 24 hours it should be removed from the forms and kept damp for from 3 to 6 days. If the concrete stays in iron forms too long, rust spots will appear on the concrete. After every six to ten times a form has been used it should be thoroughly cleaned with a wire brush and given a coat of lacquer. Immediately before each time a form is used it should be given a very thin, even coating of a half-and-half mixture of melted paraffin and kerosene.

ELECTRICAL TEST

H. J. Johnson, Duluth, Minnesota

The following is Section II of an electrical test which contains a total of 200 questions. Test I appeared on page 139 of the April, 1931, edition of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

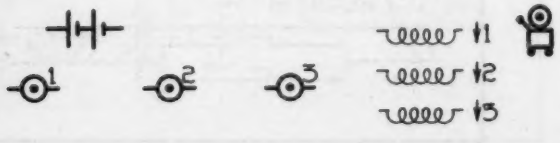
Section II

Name..... Class.....

51. Diagram this circuit so that each button rings the bell of corresponding number.

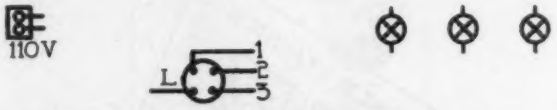
52. Diagram connections for a hall or stair lighting circuit.

53. Diagram connections for a three-point annunciator.

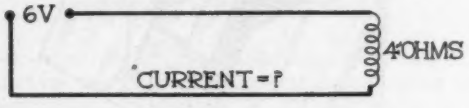


54. Diagram connections for a three-wire return-call circuit.

55. Diagram connection for a three-section electrolier circuit.

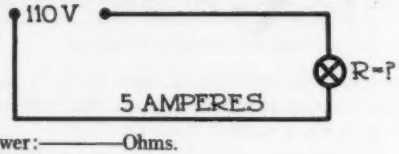


56. How much current would flow in this circuit?



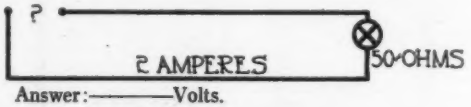
Answer: ———— Amperes.

57. What is the resistance of this circuit?



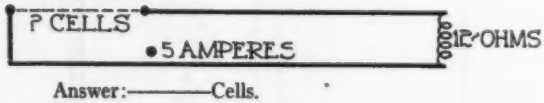
Answer: ———— Ohms.

58. How much pressure or voltage should be used in this circuit?



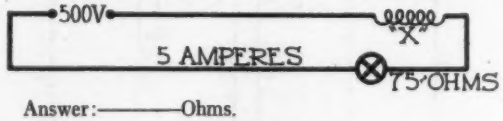
Answer: ———— Volts.

59. How many dry cells (approximately 1.5 volts each) should be used here?



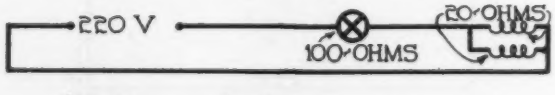
Answer: ———— Cells.

60. What is the resistance of the coil X in this circuit?



Answer: ———— Ohms.

61. How much current would flow in this circuit?



Answer: ———— Amperes.

62. The original Plante cell or simple storage cell consisted of two ———— electrodes.

63. In the modern storage cell, the active material is made into paste form and pressed into ————.

64. The positive grid contains ————paste.

65. The negative grid contains ———— paste.

66. When a cell is being charged, the solution becomes ————.

67. When a cell is being discharged, the solution becomes ————.

68. The capacity of storage batteries is rated in ————.

69. The solution of storage batteries is tested with an instrument called a ————.

70. A reading of ———— would indicate a fully charged cell.

71. In order to make up for evaporation, ———— must be added occasionally to storage cells.

72. A storage cell develops an e.m.f. of about ———— volts.

73. Automobile batteries generally consist of cells in series.

74. When batteries are to be charged from alternating current, a ———— ———— or ———— must be used.

75. Electric power is measured in ———— and ————.

76. A horse power= ———— watts.

77. A kilowatt= ———— watts.

78. When electric power is sold commercially, it is metered in ———— ————.

79. Mechanical power is measured in ————.

80. The efficiency of machines is expressed in ———— ————.

81. Electrical power in our city is sold at ———— per kilowatt hour.

82. Machines are always less than ———— per cent efficient.

83. The following rule gives the ———— of any flywheel:

$$\frac{D \times \pi \times \text{r.p.m.} \times W}{33{,}000}$$

84. A copper wire 1 ft. long and 1 mil in diameter has ———— Ohms resistance.

85. A large wire has ———— resistance than a small one of the same length.

86. A long wire has ———— resistance than a short one of the same diameter.

87. The resistance of any copper wire may be found by the rule: Resistance= ————.

88. A motor using 5 amperes on a 110-volt circuit consumes ———— watts.

89. To run the above motor for 10 hours at 6 cents per kilowatt hour would cost ————.

90. A motor using 10 horse power and delivering 8 horse power would be ———— per cent efficient.

91. Copper wires are numbered according to a standard called the ———— & ———— gauge.

92. The diameter of a wire may be accurately measured with a ———— ————.

93. The number of a wire may be determined with a ———— ————.

94. The wire most commonly used for electric conductors is No. ————.

95. The smallest standard wire made is No. ————.

96. One thousand feet of wire 20 mils in diameter would have ———— Ohms resistance.

97. Five thousand feet of wire 50 mils in diameter would have ———— Ohms resistance.

98. Wire splices must be well made and ————.

99. Splices should be covered with both ———— tape and ———— tape.

100. The ———— knot should be used inside sockets, plugs, etc.

NOVELTY PRINTING AS AN INTEREST FACTOR IN THE SHOP

Harry J. Muntz, Public School 61, Brooklyn, New York

Printing instructors find it difficult at times to maintain the interest of the students in their classes. Nor can the students be blamed for finding the lessons irksome at times, because the ordinary run of special printing jobs lose their appeal quite often. Of course, an illustrated talk on a related printing subject is sure to pep things up, but the students really desire something in more concrete form. Perhaps a student from the woodworking shop comes in and displays some article he has made, and one or the other student enviously asks, "Why can't we make something in the printshop that we can take home and use?"

The introduction of a few novelty projects will help the lagging interest to pick up, and the students will again begin to feel that the printshop is a good place to learn things after all. Novelty projects of this kind are desirable for the following reasons:

1. They create and maintain interest.
2. They are the best form of advertising for the printshop.
3. They sell the printshop to the students and their friends.
4. They improve discipline.

By dividing the various operations arising in the printing of these projects among the students, it will work out most satisfactorily and each student will feel that he has had a part in their making.

Donkey Barometer

This project solicits the coöperation of the art department, or if the students in the printshop are expert with cutting linoleum blocks, one of them may draw an illustration of the donkey and cut it out on a block about 4 by 3 in. The composition is set next in a suitable type of face and a border fitted around both type and illustration. The barometer is then printed, preferably on heavy, 10-ply, brown cardboard, size 5½ by 9 in., or a similar stock not too dark in color. A hole is then punched for the tail to be inserted and another at the top for hanging up. A hand punch will do if a machine is not available. The tail is cut from heavy brown craft cord, 2½ in. long, and put through the hole and fastened on the back by gummed paper or cloth which may be purchased in rolls. Lastly, the end of the tail is fanned out to make it appear bushy. This barometer proves to be real puzzling and among the most frequent questions asked is, "Will it really work?"

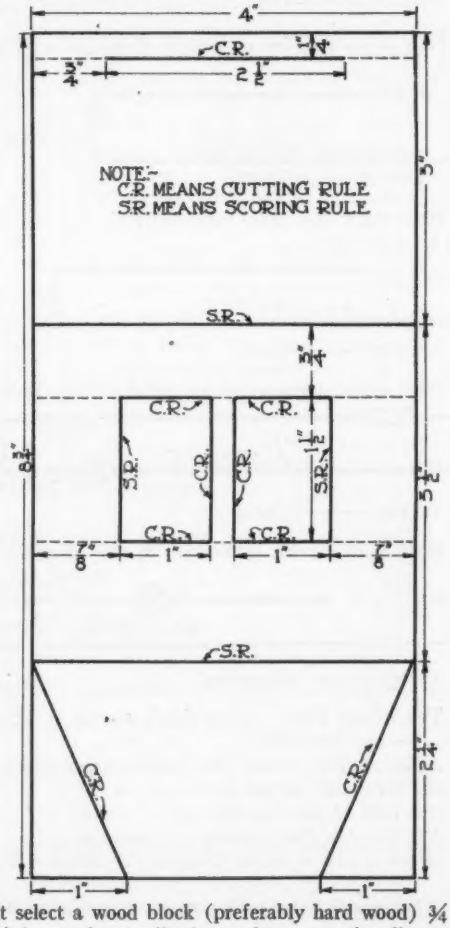
THE DONKEY BAROMETER

Daily Reminder Calendar

This desk calendar project is very appropriate at Christmas time and brings into use an interesting side line of printing — die cutting. But little ingenuity is required to construct a die-cutting form, and the diagram illustrates how this is made up.

THE REMINDER CALENDAR

The necessary materials are a block of wood, 2-point steel cutting and scoring rules, cover stock that will fold easily, calendar pads, and a suitable stock cut.[1]



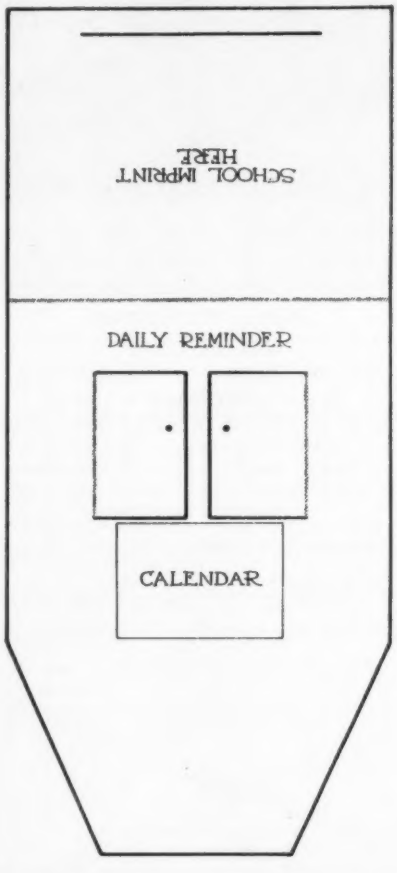
First select a wood block (preferably hard wood) ¾ by 4 by 8¾ in., and cut all pieces shown on the diagram, in-

[1]The one shown was obtained from W. S. Hancock, 1507 Arch St., Philadelphia, Pa.

cluding those that are shown in dotted lines. Next insert steel scoring and cutting rules cut to size, making sure that all joints come together evenly. Lock up the parts tightly in a chase and nail small pieces of cork at each end of the 2½-in. cutting rule at the bottom to prevent

THE STOCK CUT USED ON THIS JOB

the stock from tearing at the ends when being fed. Take the rollers off the press and prepare a hard packing with pressboard under the drawsheet. A thin sheet of tin at the bottom will safeguard the platen and make the packing stiffer. Take a trial impression so that the rules just cut



through the drawsheet. Set the guides and grippers and take an impression on the 4 by 8¾-in. stock, which should preferably be 6-ply colored cover stock. The cutting rules should sever the two corners cleanly and the doors should move out easily when pushed. After die-cutting the job, make up the type form, consisting of the line, Daily Reminder, school imprint if desired, and two 36-point periods to imitate door knobs. Feed the square end of the stock to the guides. Print the stock cut separately with the wording at the bottom, either using two cuts turned opposite, or one may suffice by running it through the press twice. Allow margin between cuts for the doors. Glue on the small calendar pads which may be obtained from any stationery store during the holiday season. Then attach the stock-cut illustration on the back so that a face will appear with wording in the center of each door opening. Fold the stock back on the scored lines and put the small end through the slit and the project is ready for use as a desk calendar.

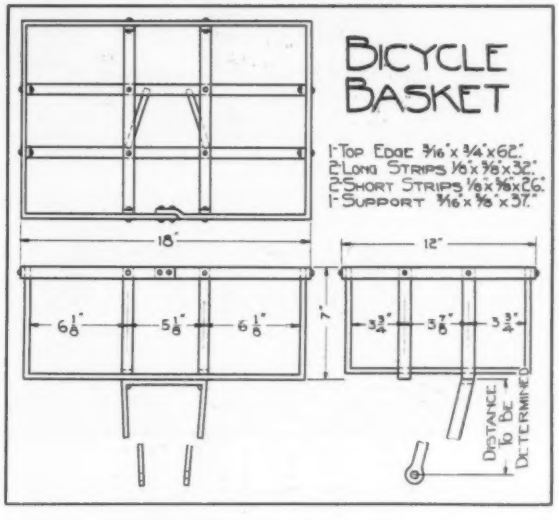
A BICYCLE BASKET

J. W. Bollinger, Tulsa, Oklahoma

Typical Instruction Sheet for the Metal Shop

The basket shown in the accompanying illustration is intended for carrying newspapers, and is as light and as strong as it can be made.

The sizes may be changed if desired, depending on the use that is to be made of the finished basket. Decide on the best length, width, and depth suitable for the purpose planned, and decide also on the number of crosspieces and the spacing of them, depending on the size of the smallest article it is intended to carry. If many crosspieces are to be used, they may be made of ⅛ by ½-in. iron or even of No. 16 by ⅜-in. iron, riveted with ⅛-in. rivets. Have your instructor check your plan.



Directions for making the basket are as follows:

1. Bend the top edge, allowing it to overlap 2 in. on the back side. Rivet the ends together.
2. Carefully space out the holes for riveting on the crosspieces, and drill them 3/16 in. or 13/64 in.
3. Bend the crosspieces running the longest way and rivet them in place. Be sure to have the basket the same depth everywhere.
4. Bend and rivet the short crosspieces in place.
5. Rivet the long and short pieces together.
6. Lay out and bend the piece for the support. Rivet it in place.
7. Determine the location of the holes for fastening the support to the axle of the bicycle. These holes will need to be ⅜ in. for most bicycles, and if such holes were drilled in ⅝-in. iron, it would leave the piece too weak. Instead, drill two ¼-in. holes next to each other, chisel out the waste so as to form oblong holes, and spread these holes out round and ⅜ in. in diameter with a long, tapered punch.
8. Paint the completed job with two coats of flat black paint.
9. Fasten the upper edge of the basket to the handlebars with leather straps.

WATERTOWN MODEL YACHT CLUB

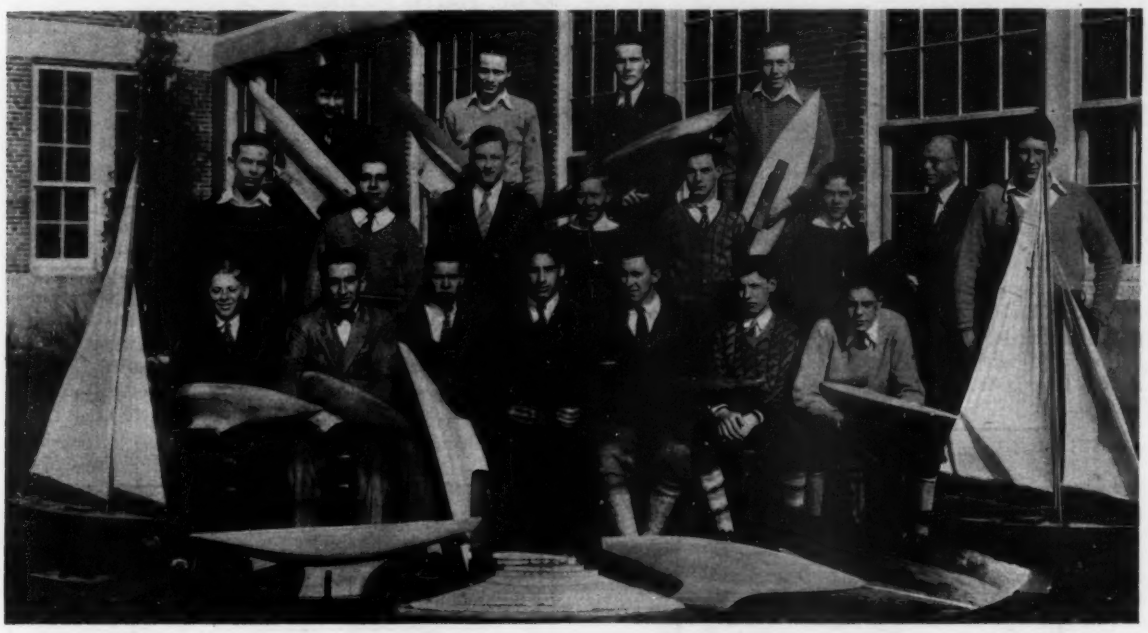
John Black, Senior High School, Watertown, Massachusetts

During the winter of 1928–29, several boys of the Senior High School, Watertown, Mass., organized a model yacht club and began building models during the club period at school.

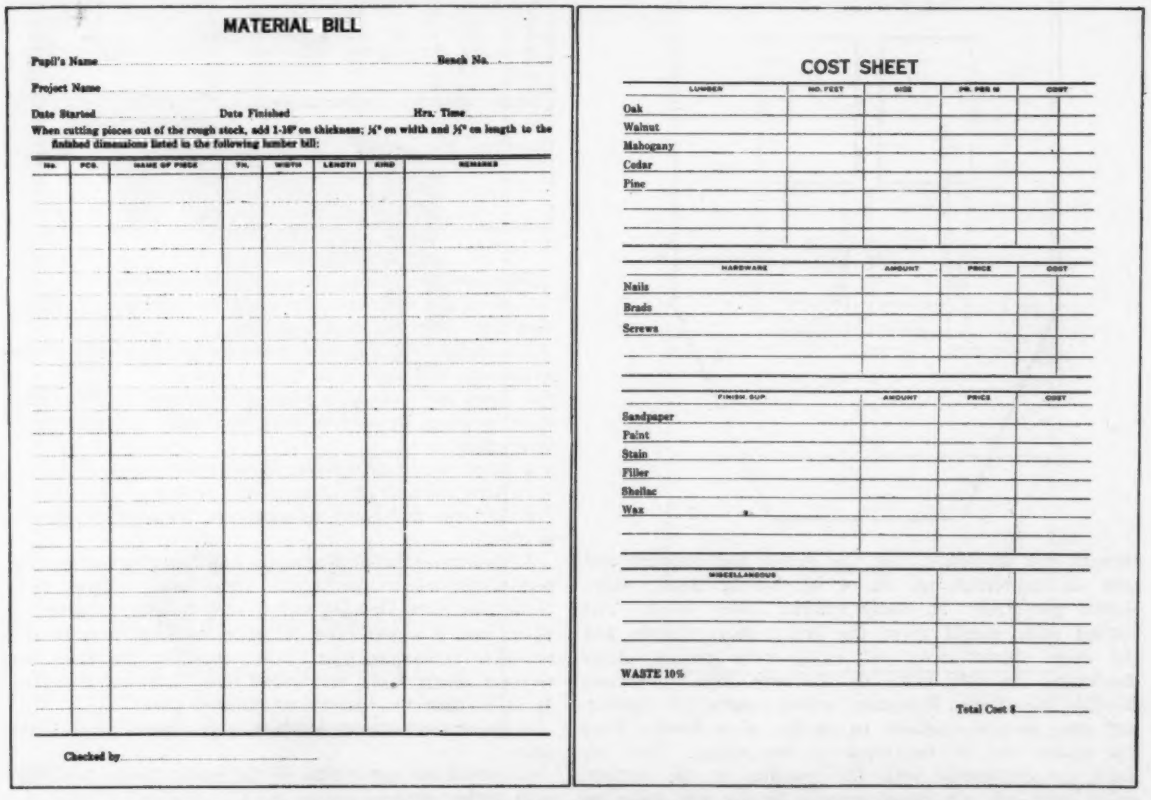
Several designs were submitted by a committee appointed by the club and after much discussion as to the merits of the several designs the sea-scout design, published in the February, 1929, issue of the INDUSTRIAL-ARTS MAGAZINE was selected.

That winter 15 models were completed by working extra time after school.

Races were held late in the spring and many thrills were had. The fact that each boy made his own model gave him greater interest in the racing. Silver cups were presented as prizes.



WATERTOWN MODEL YACHT CLUB, SENIOR HIGH SCHOOL, WATERTOWN, MASS.



MATERIAL BILL

Pupil's Name ..... Bench No. .....

Project Name .....

Date Started ..... Date Finished ..... Hrs. Time .....

When cutting pieces out of the rough stock, add 1-16" on thickness; ¼" on width and ½" on length to the finished dimensions listed in the following lumber bill:

No.	PCS.	NAME OF PIECE	TH.	WIDTH	LENGTH	KIND	REMARKS

Checked by .....

COST SHEET

LUMBER	NO. FEET	SIZE	PR. PER M	COST	
Oak					
Walnut					
Mahogany					
Cedar					
Pine					

HARDWARE	AMOUNT	PRICE	COST	
Nails				
Brads				
Screws				

FINISH, SUP.	AMOUNT	PRICE	COST
Sandpaper			
Paint			
Stain			
Filler			
Shellac			
Wax			

MISCELLANEOUS			
WASTE 10%			

Total Cost $.....

FRONT AND BACK OF A BILL OF MATERIAL FOR THE WOODWORKING SHOP. ORIGINAL BILL OF MATERIAL 8½ BY 11 IN. SUBMITTED BY REX ATON, JUNIOR HIGH SCHOOL, MARSHALLTOWN, IOWA

Last year 12 more models were built and raced. There were 3 prizes for all and 2 special prizes for the first-year boys only, no boy to win more than one prize.

The sea-scout model is very popular here as the design is not only up to date and beautiful, but the model sails perfectly.

The fin and skeg type was used and each model was fitted with a Braine steering gear. Spinnakers were also used.

The club is limited to 20 members, preference being given to the members of the junior class.

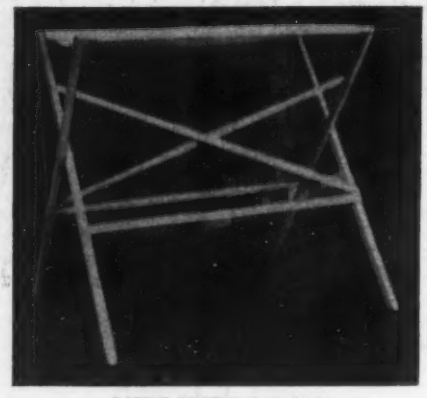
This year the boys who have their models overhauled and finished are to take up the study of elementary yacht design.

At an open race held on October 12 at Boston two of the models won first prize each, in the open and free-for-all races.

BABY'S DRESSING TABLE

W. L. Ruden, Union High School, Salinas, California

Any mother with a baby will appreciate a table like this. It is easy to make and the materials cost very little.



BABY'S DRESSING TABLE

Bill of Materials

2 pc.	¾ x 36	Maple doweling
1 pc.	¾ x 1 x 14′	Oregon pine
1 pc.	⅜ x ¾ x 13′	Oregon pine
2	¼ x 2	Stove bolts
4	No. 8 x 1½	Wood screws
6	⅜	Iron washers
1 pc.	24 x 36	Canvas

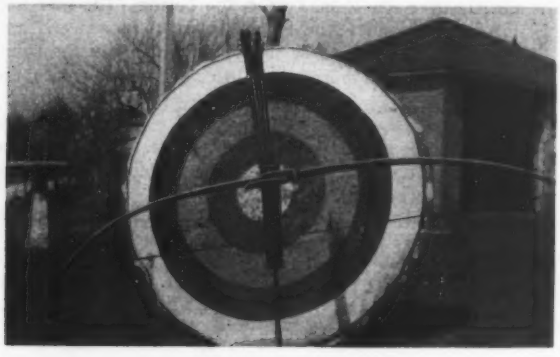
Directions

1. Cut four legs from the ¾ by 1-in. piece each 3 ft. 4 in. long. Bevel one end of each so that it will rest evenly on the floor when the table is open. Notch the top end of each leg. Bore a ¼-in. hole in each leg 16 in. from the top.
2. Cut two 3-ft. crossbars from the ⅜ by ¾-in. stock and nail them to the legs, 14 in. from the lower ends.
3. Lay out the braces by placing them in position on the legs, being sure that the latter are square with the crossbar. Cut the braces and nail them in position.
4. Hinge the two pairs of legs together with the stove bolts. Washers between the legs and at both ends of the bolts permit the table to fold more easily.
5. Cut the ends of the doweling so as to fit into the notches in the legs. Drill pilot holes for the screws.
6. Fold the canvas over 2 in. at each end so as to give a length of 32 in. Make a loop on each side just large enough to slide over the doweling. This can be done very neatly on a sewing machine.
7. Finish the wood by enameling or in some other way.
8. Place the doweling in the canvas loops, and fasten the two pieces to the legs with screws.

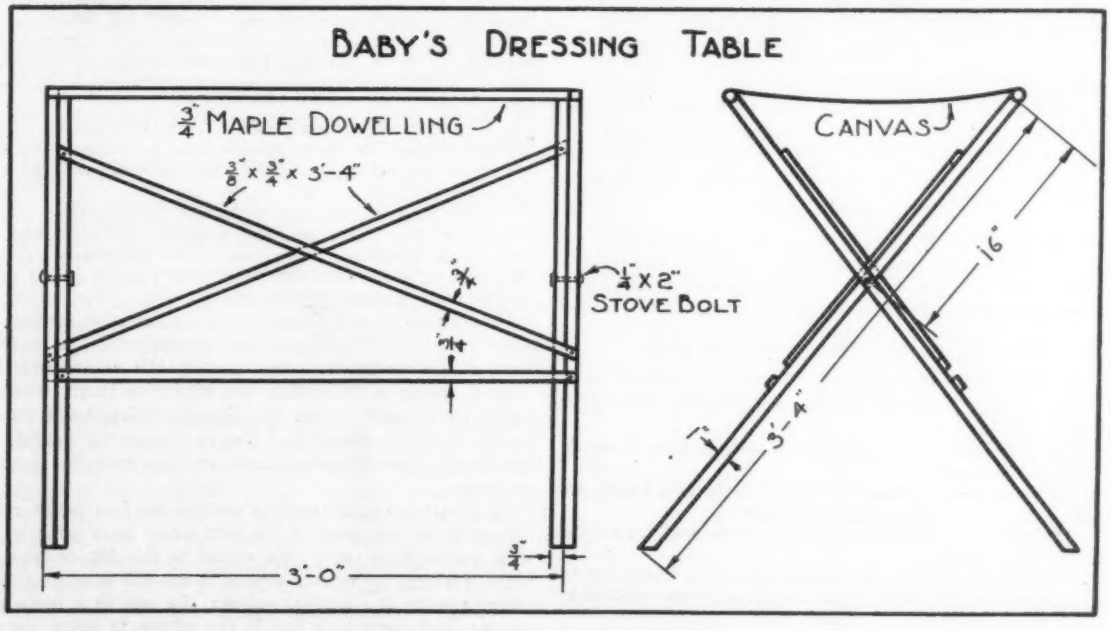
ARROW AND BOW STAND

D. O. Pullin, Western State Teachers College, Kalamazoo, Michigan

The arrow and bow stand shown in the accompanying illustration is used to hold the arrows while shooting at the target, and to support the bow when one is through shoot-



THE ARROW AND BOW STAND



ing. This is a good project for the sheet-metal class, and a very handy and useful addition to the archer's equipment.

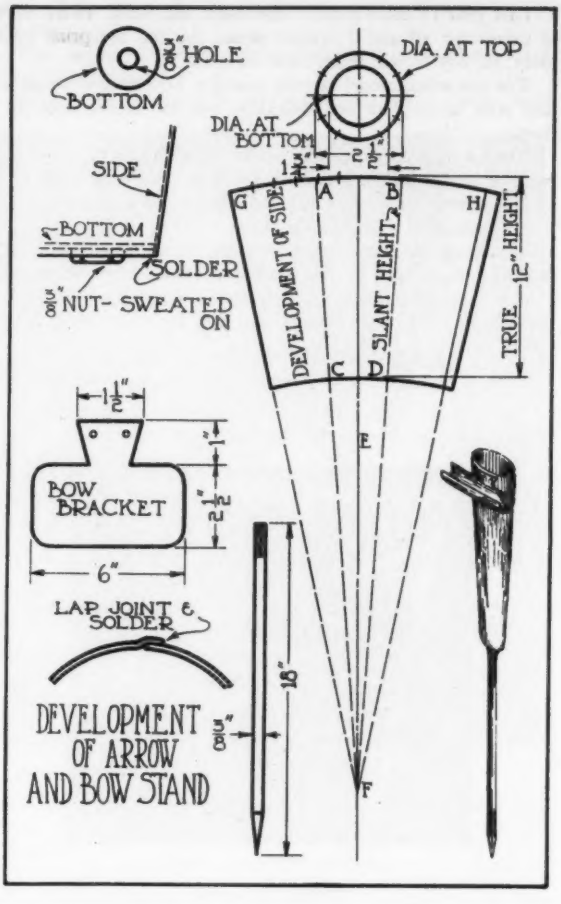
The arrow stand is 2½ in. in diameter at the top, 1¾ in. in diameter at the bottom, and 12 in. high. To make a layout of this stand, draw the side view A, B, C, D of the stand with a vertical line E passing through the exact center. Extend the lines AC and BD, representing the sides of the stand, downward until they intersect. Using the point of intersection as a center, draw an arc of a circle through points A and B, and another through points C and D. Compute the circumference of the stand at the top and locate this distance on the first arc in such a way that half of it will lie on each side of the center line E, as at G and H. Or divide the top view into, say 12 parts, and lay off the length of one of these arcs 6 times on each side of the center line, as is shown in the illustration.

Draw a line through center F and point H; also one through center F and G. This will determine the angle of the cuts to be made. The circumference of the bottom of the stand will not have to be computed, as the proper points on the second arc representing the bottom of the stand will have been automatically located by the intersection of this arc with the lines passing through FH and FG.

On one end of the pattern for the side of the stand, an allowance must be made for the lap joint. This line, representing the allowance, must be drawn parallel with line HF and will not, therefore, pass through the center point F.

A little study must be given the method of inserting the bottom, and joining the sides to it. The ⅜-in. nut is sweated on exactly over the ⅜-in. hole in the bottom. The iron rod, ⅜ in. diameter and 18 in. long, is pointed on one end and threaded on the other to fit the ⅜-in. nut. When the stand is in use, it is held upright by forcing this point into the ground.

The bow bracket should be bent to a semicircle. It is fastened to the arrow stand by its flange, which must be shaped to conform to the curve of the container and riveted close to the top of the stand.



A Coöperative Study Fostered by the A. V. A. Committee on Standards

PART IV—A TENTATIVE ANALYSIS OF SHEET-METAL WORK

R. W. Selvidge*

The complete plan for this coöperative analysis was set forth in detail on page 189 of the May, 1931, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. The summary is here repeated for the information of those who did not have an opportunity to read the complete statement of the plan.

Summary of the Plan

In order to coördinate the efforts of a great number of teachers who are engaged in attempts to analyze the various industrial-arts subjects and the skilled trades for the learning units involved, the following plan is proposed:

How the Individual Shop Teacher Can Help

On account of the importance of such an analysis as a basis of effective teaching the following plan for coöperative effort is proposed.

1. Every teacher who is interested in such an analysis should join in this undertaking.
2. All industrial-arts subjects, as taught in the high school, are to be analyzed, for the learning units involved.
3. That the principal skilled trades are to be analyzed for the learning units involved.
4. Tentative analyses of the selected subjects, or trades, are to be published and distributed as rapidly as may seem practicable.
5. Any shop teacher or supervisor who is willing to coöperate, or to offer suggestions in the way of modifying, adding to, or taking from, the original list, should send such suggestions or comments to R. W. Selvidge, University of Missouri, Columbia, Mo., or to William T. Bawden, Peoria, Ill., chairman of the committee.
6. Suggestions thus received should be carefully studied, edited, and incorporated, as far as possible, into the original lists, and the revised lists published, together with the names of those who coöperate.
7. Those who are interested should send in the analysis of any subject, or trade, which they have prepared, and which may be used by the committee as the basis of the preliminary analysis. This form of coöperation will be of great value in getting more satisfactory preliminary lists of units.

In order to get the project started, a tentative analysis of sheet metal foilows. Those who are interested in coöperating in this matter are asked to study this outline with the view of adding to it anything that should be taught which is not in the list and striking out anything which should not be taught. Teachers should feel free to change the wording of any item to make it more definite, or more inclusive, or more exclusive.

In the study of the tentative analysis the best plan for the teacher is to take some of the jobs which he is using in his shop and analyze them with regard to this list of learning units. Perhaps the easiest way of doing this is to place the learning units in a vertical column, the jobs in a horizontal column, and check each unit in the column in which the job

*University of Missouri, Columbia, Missouri.

appears. ***There must be definite working drawings and specifications for each job, or a correct analysis is impossible.*** If it is found that the jobs contain learning units not in the list, such units should be added.

The Tentative Analysis of Sheet-Metal Work

There is no very good reason why sheet-metal work in the high school should be confined to the use of tin and galvanized iron. Although these metals are cheap, and waste products often may be used to teach some of the fundamental learning units, the teacher who confines his work to these materials loses an opportunity to arouse interest in the æsthetic elements of design and the finer things in craftsmanship.

Five cents will purchase enough copper to make a small, well-designed, well-finished tray, or some other article of pleasing and attractive appearance, which will have a permanent place in the home and be a priceless treasure to mother or sister. Copper is man's most friendly metal, and boys should have an opportunity to get acquainted with its qualities and characteristics. For this reason, learning units dealing with other metals than tin and galvanized iron are included.

This analysis is for what is usually covered in a high-school course, and is not intended to cover the trade of sheet-metal work.

The list of learning units, as far as the student is concerned, should be divided into three principal groups: The things he should be able to do, the things he should know, and the things he should be. The first group involves *manipulative skill, knowledge of procedure, and construction processes.* The second group involves *information concerning qualities and characteristics of materials* and other matters of general interest in the field. The third group involves *attitudes and habits which affect the success of the individuals.*

The Learning or Teaching Units

The things the student should be able to do:

1. To make out a bill of material.
2. To check material when received.
3. To plan the procedure in doing a job.
4. To transfer patterns to sheet metal.
5. To use tinners' snips in cutting metal.
6. To solder tin, copper, brass, and galvanized iron.
7. To solder aluminum.
8. To sweat a joint.
9. To light and operate a blowtorch or gas furnace.
10. To use the squaring shears.
11. To form by hand.
12. To use a bar folder.
13. To turn edges for a hem.
14. To fold a curved edge.
15. To rivet joints.
16. To countersink by hand.
17. To punch holes with solid punch.
18. To punch holes with hollow punch.
19. To raise or bump sheet-metal forms.
20. To roll a sheet on forming machine.
21. To wire edges on wiring machine.
22. To use the circular shears.
23. To wire edges with bar folder and hammer.
24. To turn a lock seam.
25. To groove with hand groover.
26. To groove with grooving machine.
27. To use a burring machine.
28. To make a setting-down seam by hand.
29. To make a setting-down seam on a machine.
30. To make a double seam on stake or machine.
31. To double seam at bottom.
32. To double seam corners.
33. To crimp or shrink edges.
34. To use cornice brake.
35. To use the taper edger.
36. To use the tube formers.
37. To use the square stake in forming.
38. To use the hatchet stake in forming.
39. To drill holes in metal.
40. To use a cold chisel.
41. To stretch metal with hammer for flange or joint.
42. To use a hand swage.
43. To use a beading machine.
44. To braze with hard solder.
45. To lay out and form hinges.
46. To prepare cut acid flux.
47. To anneal copper or brass.
48. To give hammer finish to copper or brass.
49. To apply lacquer finish.
50. To color copper or brass.
51. To etch on copper or brass.
52. To clean copper with acid.
53. To tin soldering copper.
54. To use a cold chisel.
55. To use the hack saw.
56. To use the file.
57. To use taps and dies.
58. To bend, twist, and form wire.
59. To bend, twist, and form strap iron.
60. To develop patterns for right cylindrical objects.
61. To develop patterns for objects rectangular in section.
62. To develop patterns for elbows.
63. To develop patterns for conical objects.
64. To develop patterns for oblique, conical objects.
65. To develop pattern for spout.
66. To develop pattern for lip.
67. To develop pattern for T.
68. To lay out pattern for mitered corner.
69. To lay out pattern for solid corner.

The things the student should know:

1. The kinds of solder and their uses.
2. The kinds of fluxes and dipping solutions and their uses.
3. The names of tools, equipment, and operations in the sheet-metal shop.
4. How to care for tools and equipment.
5. Be able to identify the various kinds of sheet metal.
6. The gauges of sheet metal.
7. Standard sizes of soft-iron wire.
8. Source and characteristics of tin.
9. Methods of manufacturing tin plate.
10. Commercial sizes of tin plate.
11. How galvanized iron is made, grades and qualities.
12. Commercial sizes of galvanized-iron sheets.
13. Source, use, and characteristics of copper.
14. Composition of brass, its characteristics and uses.
15. Sources, characteristics, and uses of aluminum.
16. Sources, characteristics, and uses of zinc.
17. Kinds and sizes of drills.
18. Kinds and sizes of rivets.
19. How to specify grades of tin plate and galvanized iron.
20. Occupational information, including the success factors, wages, and opportunities in the industry.

What the student should be:

The list of attitudes and habits which contribute to the success of individuals in any vocation was given on page 191 in the May, 1931 issue of this MAGAZINE, and is not repeated here.

ELEMENTS OF JOB COMPOSITION—III

Frank P. Rich, Roxbury Memorial High School, Boston, Massachusetts

Balance and Proportion

One of the primary elements and a fundamental principle in typographic design is that of balance. While, horizontally, the point of perfect balance is in the center, vertically it is not. Proof of this is shown by the fact that a line of type placed in the exact center of a page, from top to bottom, appears low (Fig. 1). For this reason, and for the added reason that we read from the top down, the eye of the reader naturally falling first to a point near the top of the design, we should place our main display near that point. The exact position of this point of perfect balance is often questioned, personal taste being responsible for its slight variance with

FIG. 1

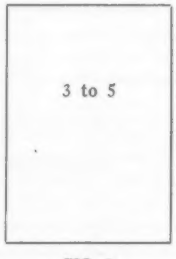


FIG. 2

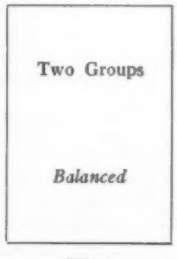


FIG. 3

different authorities. However, all agree that it is near a point which is in the center of a line dividing a page into two sections giving the upper section three of eight units and the lower section five (Fig. 2).

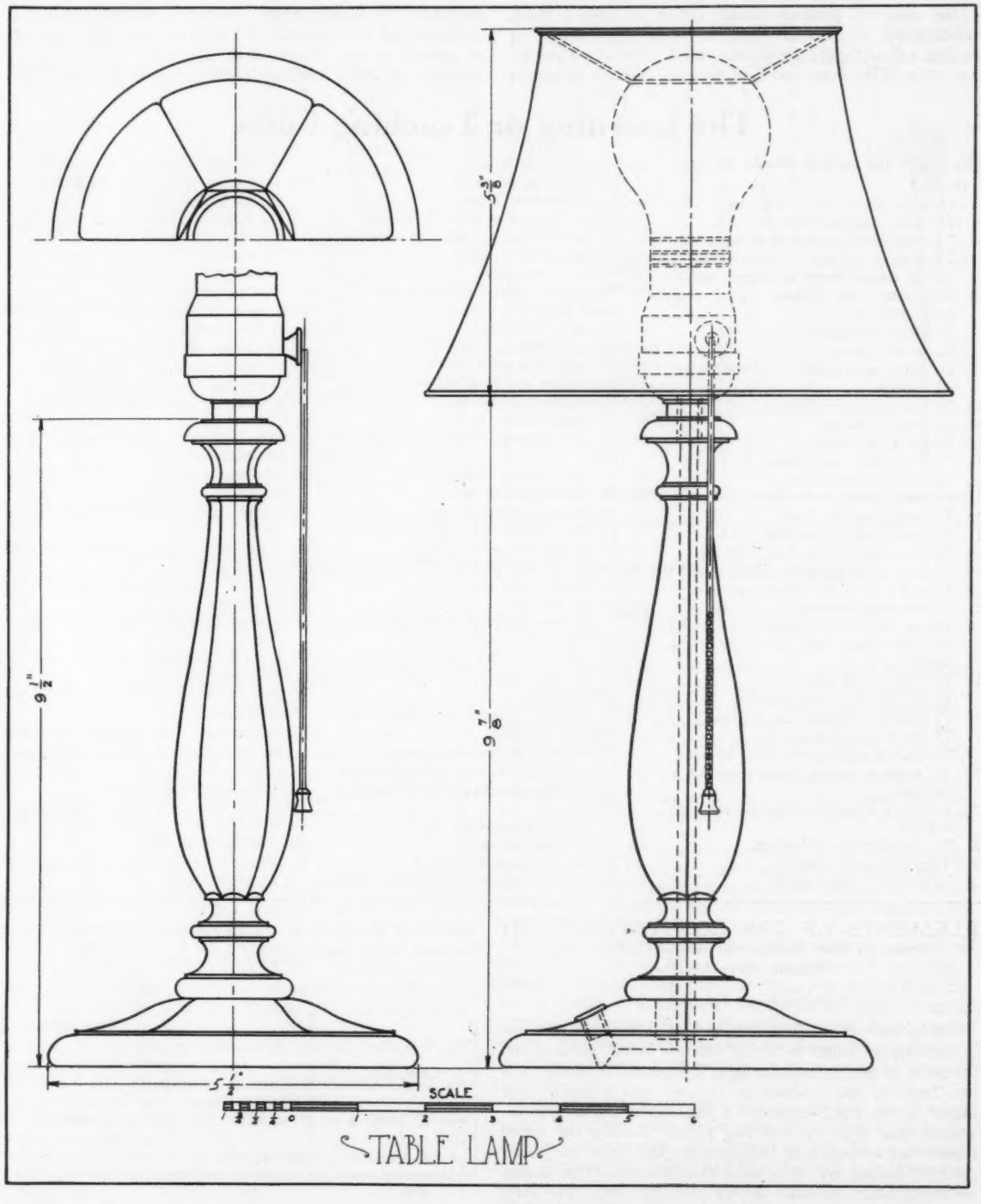
When more than one group is to be placed on a page, the line dividing the page into proportions of 3 to 5 should be used as the center of the groups. To properly balance the two groups, the upper group must be removed in proportion to the ratio it bears to the added lower group (Fig. 3).

The artistic merits of typography are governed by fixed principles, the same that govern any art, a knowledge and application of which are necessary to produce good work. Balance is one of these principles. It demands that we place the main strength of typographic designs near the top of the page.

TABLE LAMP

Claude V. Hodges, Hamilton Technical Institute, Hamilton, Ontario, Canada

The table lamp illustrated herewith shows how the architectural drawing and woodworking departments of a school may coöperate. The lamp was designed in the architectural-drawing rooms and constructed in the cabinetmaking shop. The actual model was made from two pieces of burl walnut. A



hexagonal shape was selected for the shaft with turned cap, and a base which again recalls the hexagonal form of the shaft. A hexagon was chosen for the form of the shaft in preference to an octagon so that more interest would be given to the design by the difference between the front and side views. The setting out followed the usual methods, and lines were scribed by surface gauge to obtain the sides of the hexagon while the work was still held between lathe centers. The finish consisted of filling, shellacking, varnishing, and rubbing to an eggshell gloss, producing a very artistic piece of furniture.

NOW, Are There Any Questions?

Lacquering Near Soldering Furnaces

944. Q.: Is it a safe practice to use lacquer in a general shop where soldering or other use of gas furnaces is in progress? Can approximately the same effects be secured by the use of the safer four-hour or quick-drying enamels? I will appreciate any other suggestions relating to finishing this type of project. — *F. D. F.*

A.: The matter of fire risk attending the use of brushing lacquers has been greatly exaggerated. In a recent test I brushed a coat of lacquer on a 5 by 8-in. panel and immediately held a lighted match a quarter inch above the surface with entirely negative results. As a matter of common sense, however, I should have the lacquering done in a section of the shop removed from the gas furnaces to safely eliminate the ever-present human element. In this way it is easier to avoid the possibility of a can of open lacquer or thinner being upset or having its fumes ignited from an open flame.

These conditions do not apply to spraying lacquers whose lower flash point thinners and easily exploded spray dust necessitate the maximum caution. In any case, plain common sense based on a knowledge of local conditions must be the governing factor.

In many cases equally beautiful and desirable results can be obtained with four-hour enamels. If the high gloss of the enamels is objectionable, it may be removed by sanding the enameled surface lightly and carefully with 00 steel wool. For finishing iron lamps, antique copper, verdegreen copper, and dull black are probably the most effective color schemes. There is, however, an endless variety of effects which can be secured by stippling one color with tissue paper, newspaper, crumpled rag or sponge over a base color of a contrasting type. As a matter of fact, from one to four stippling colors can be used. — *Ralph G. Waring.*

Shellac Troubles

947. Q.: We are having trouble with shellac finishes and wish you would tell us the cause of our trouble.

We find it impossible to apply shellac without showing heavy brush laps and streaks. The shellac when applied soaks in at the center of a panel or board surface and on the edge of a surface it builds up heavily and does not dry. We usually allow 24 hours between coats. Our finishing room is dry and well ventilated. We have used several brands of standard shellac. We thin our shellac with denatured alcohol No. 188 which was purchased at a filling station. Regardless of how much the shellac is thinned with alcohol the results are the same.

Please give method of applying shellac finish on a cedar chest. — *F. O. M.*

A.: Your entire trouble comes from the use of the wrong type of denatured alcohol. There is no type known as No. 188. This is the "apparent proof number" of all denatured formulas from No. 1 to No. 7 inclusive. The one most desired for reducing shellac is No. 1 based on 100 gallons of Ethyl (grain) alcohol plus 5 gallons of approved wood alcohol. This is ideal for the purpose.

In the denatured alcohol which you purchased from your filling station the chances are that it is based on kerosene, pyridine, or both, as the added denaturants. In this case, the oily residue is sufficient to prevent the shellac from drying as it should. As you now have learned, "antifreeze" or radiator alcohol cannot be used for reducing shellac. Purchase your alcohol from a reputable paint-supply house.

Recent advance in shellac practice calls for the use of a 2-lb. cut (standard 4 lb. shellac reduced ½ with denatured alcohol). This should be poured into an equal amount of shellac mixing lacquer as made by Murphy or Pratt & Lambert varnish companies. This improves the shellac by increasing its resistance to water; makes for much easier sanding; offers greater adhesion to succeeding varnish or enamel coats; and makes a much better drying material. It oil-rubs to a fine surface.

Better results can be had on red cedar by using varnish and no shellac at all. The resulting color is entirely lacking in the gray undertone which gradually accumulates under shellac. Use the newer 4-hour types. For all shellac finish, reduce as described in the foregoing. Allow three hours for drying between coats, and sand with a split 6/0 paper. Let the last coat dry overnight and then rub with any neutral oil or paraffin oil which has been reduced one half with coal oil or kerosene. Clean up with a mild soapsuds such as Ivory when the rubbing is complete. If you have not already found out, it is best to use a soft fitch or bear single-thick, full-chisel, varnish-flowing type of brush. Shellac should be applied with as few strokes as possible, avoiding any tendency to handle it as though it were paint. — *Ralph G. Waring.*

Among the Industrial-Arts Teachers

¶ Prof. Albert Edward Phillips, of the department of civil engineering, Armour Institute of Technology, Chicago, died on April 19, in a local hospital, after an illness of five weeks. He was 68 years old. Professor Phillips was educated at Union College, Schenectady, N. Y. After teaching at Purdue University, he engaged in private practice, and later was professor of bridge engineering at the Wisconsin University. He was the author of numerous texts on civil-engineering subjects.

¶ Mr. M. M. Krieps has been elected president of the vocational school board at Superior, Wis. Mr. Charles Boswell was elected vice-president, and Mr. James Thompson secretary-treasurer.

¶ Mr. Donnan Fiester has been appointed instructor in manual training and mathematics at Randalia, Iowa.

¶ Miss Agnes Watson, of Vincennes, Ind., has been appointed head of the home-economics department in the state vocational department, to succeed Miss Ethel Snodgrass.

Home-Economics Association Meets at Detroit

The twenty-fourth annual meeting of the American Home-Economics Association will be held June 22–27, at Detroit, Mich. Miss Julia P. Grant, supervisor of home economics, Detroit, is chairman of the committee on arrangements. The Book-Cadillac Hotel will be headquarters for the meeting.

Association and Convention News

NEW YORK SCHOOL CRAFTS CLUB MEETS

The April meeting, which took the form of a project meeting, brought out a large number to the dinner and meeting. The program comprised projects to be presented by the members to the assembled group, the projects being especially selected from 50 or more shops. After the dinner, each member stood beside his project, ready to give information regarding its structure and plans. Through this plan, it is believed that a good deal of information may be obtained through the exchange of ideas and problems.

The round-table discussions following the project exhibitions were unique, in that each one had something to offer which was out of the ordinary. At table one, Mr. John C. Cavileer, Montclair, N. J., displayed a fleet of model speed boats, which were capable of varying speeds. A particularly fast model, 4 ft. in length, was capable of traveling 20 miles an hour, and was equipped with a steam motor working at 150 lb. pressure.

In another part of the room was Mr. Samuel Tannenbaum, of New York City, who had an exhibit of art-metal work. He demonstrated the use of acid in etching, heat in annealing, and other steps in the working of pewter, brass, and copper projects.

On a third table was a collection of pictures, books, plans, and scale models of sail, row, and motor boats. Mr. Arnold M. Hess, who is in charge of this work in the Atlantic City High School, showed how this type of work may be carried on in a large general shop where the water facilities are accessible and where there is a natural interest in boating projects. The boats are built by individuals, and by groups of two, at costs ranging from $10 to $150. The boys are encouraged to make a study of the entire project before beginning the planning and construction. The boys select the best wood, fastenings, and other necessary materials, and after finishing, learn about the manipulation of boats.

The May meeting, the final one of the school year, it was decided should be the annual banquet meeting. — *A. M. H.*

THE APRIL MEETING OF THE BOSTON VOCATIONAL SOCIETY

The Vocational Education Society of Boston held its monthly meeting April 11, at the Hotel Westminster, Boston. Since it was the annual members' meeting, the speakers were chosen from the society's membership. The general topic for discussion was "Coöperative Education," and four of the coördinators were selected to present this type of education.

The first speaker was Mr. Arlon O. Bacon, of the Dorchester High School, Boston, who talked on the subject, "Production Work in the Coöperative High School," speaking on the organization and type of work which is carried out in this school. Each class is divided into four groups, one group going to the millroom, while the other three go to the benchrooms. At the end of the first quarter, a change is made and new groups are assigned to the classes. Although the three benchrooms are identical, it is planned to have each boy work in all three, so that each student will have the advantage of varied experience and training under different instructors. An attempt has been made to obtain jobs in multiples of three so that the same work may be carried on in all three benchrooms. The work is obtained from a variety of sources, but chiefly from instructors, friends, and neighbors of the students.

The second speaker was Mr. James Clarke, of the Hyde Park High School, who spoke on "Placement and How the Courses Help the Boys to Find Themselves." Mr. Clarke explained that during the third and fourth years, the boys are sent out to work in the industry for one half of the time, that is they spend one week in the school, and the next week in the shop. Each boy has a partner who alternates with him in the work. During the depression it was extremely difficult to find new positions for the boys.

The third speaker, Mr. Thomas Roche, of the South Boston High School, spoke on "The Organization of the Coöperative Course," pointing out that the course extends over a period of five years. During the fifth year the boy spends his entire time in the industry getting the required shop hours for his diploma. Classes are state aided only during the last three years. During the week spent in school, the boys receive instruction in science, drawing, hygiene, English, and social science, and the students are organized as a separate unit, with the coördinator acting as the director of the unit.

Mr. Patrick Smith, of the Memorial High School, the fourth speaker, took as his subject, "Relations of the Coöperative School to the Employer and the Employers' Organization," in which he stressed the fact that he tried to make the employer see that it is to his advantage as an employer to have coöperative students in his shop, and that it is not merely a case of helping the school by giving the boy employment. Generally speaking, he said the small shop is the best for placing boys, as it is not so likely to hold the boy to the same job for a long period of time. A complaint of some employers was that the boys are lazy, but this he believed to be due to the teacher's failure to stress the speed factor in carrying out the shopwork. The members freely asked questions regarding certain phases of the work.

May 23 was the date chosen for the joint meeting with the Rhode Island Vocational Society. — *Louis A. Van Ham.*

EASTERN ARTS ASSOCIATION CONVENTION

The industrial-arts sectional meetings held at Atlantic City, under the direction of Mr. Joseph Constantine, of Passaic, were both helpful and interesting. Practical questions were brought before the large gathering of men by leaders especially selected because of their contributions in the field.

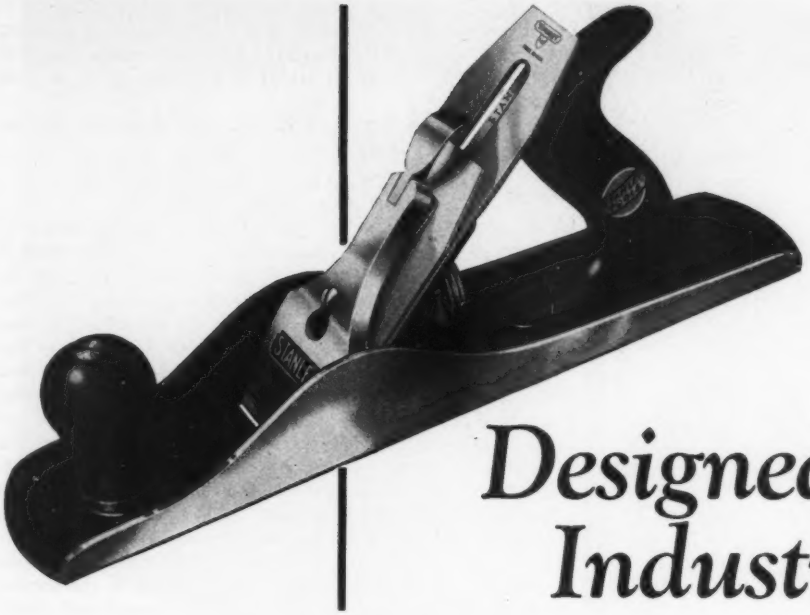
Dr. F. T. Struck, of Pennsylvania State College, in his talk on "Present Practices and Trends in Industrial-Arts Education," gave proof that the general shop was the most vital problem for present-day industrial-arts men. Various types of shops were considered, including the general woodcraft shop, and the general metal shop, which offer the boy a wide range of information.

"Present Practices in Adult Education" was discussed by Mr. Wesley J. O'Leary, of New Jersey, who emphasized the fact that adult education is receiving increased attention, and that hobby work is helping to retain the shop interest of boys. He urged the continued use of well-equipped shops by adults and pointed to the enormous sales of home workshop equipment and the increased interest in handwork.

Mr. Edward J. Berman, of Bayonne, N. J., in his talk on "Problems in the Training of Youth for Industry," said that vocational schools must consider the possibilities before training pupils for a specific industry. He urged that the variety of trade be increased rather than that classes be enlarged to meet the needs of the prevailing industries. He said that the development of a proper attitude toward the employer and fellow workers is an important task and the assistance of industry should be encouraged in every industry.

Mr. Jack Penino, of Vineland, in his talk on "Wrought Iron Work," brought out that there is another subject outside of the traditional woodwork. Some of the work of his students was on display which attracted a good deal of attention. Mr. Penino emphasized the value of good design and an appreciation of the beautiful in each product turned out.

(Continued on Page 22a)



Designed for Industrial Arts

THE STANLEY "Bailey" Plane, No. 5¼ was especially designed to meet the requirements of the school shop.

Its length — 11½ inches — allows it to be used either as a Smooth or as a Jack Plane. It has a 1¾ inch cutter. The boys of the Elementary and Junior High Schools enjoy working with this medium weight and well proportioned plane.

Maintains the high standard of quality that has made Stanley "Bailey" Planes the favorite for over 60 years.

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Stanley Tool Catalog No. 34A

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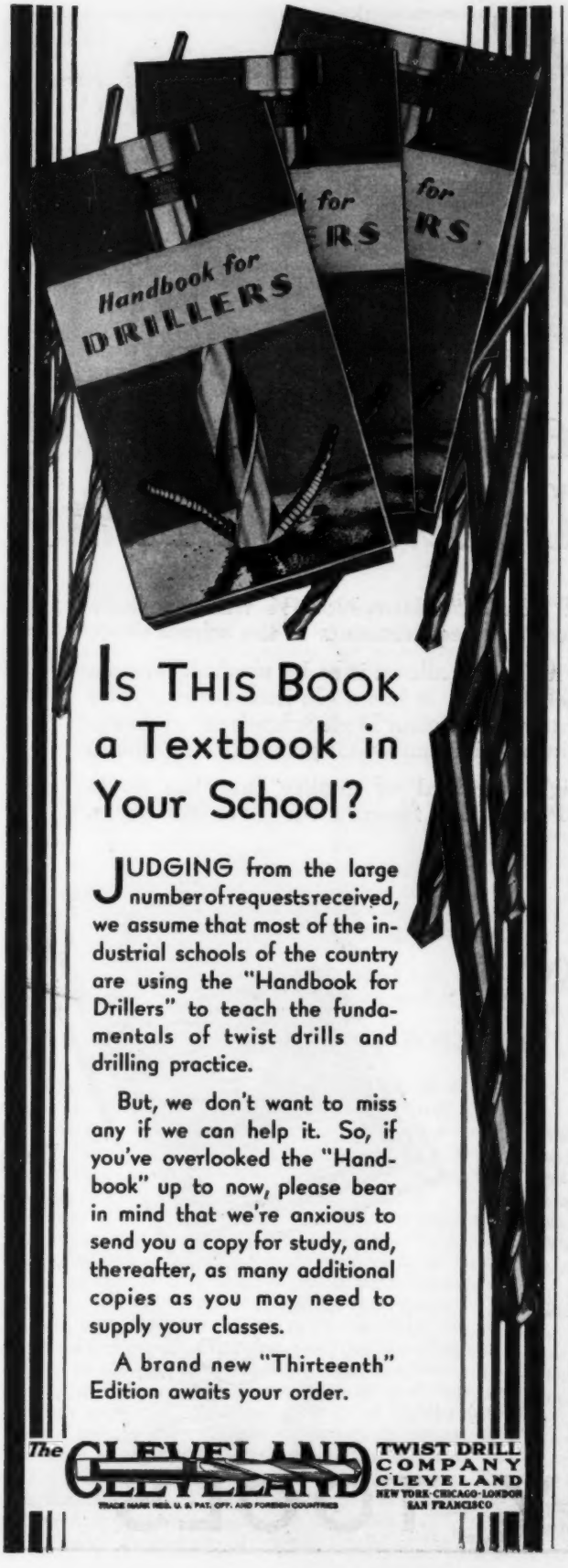
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JUDGING from the large number of requests received, we assume that most of the industrial schools of the country are using the "Handbook for Drillers" to teach the fundamentals of twist drills and drilling practice.
But, we don't want to miss any if we can help it. So, if you've overlooked the "Handbook" up to now, please bear in mind that we're anxious to send you a copy for study, and, thereafter, as many additional copies as you may need to supply your classes.
A brand new "Thirteenth" Edition awaits your order.
The CLEVELAND TWIST DRILL COMPANY CLEVELAND
NEW YORK-CHICAGO-LONDON
SAN FRANCISCO

(Continued from Page 236)

A committee was appointed to make a study of the relation of industrial arts in the life of the junior-high-school boy. The committee will make its report at the meeting to be held next year.

Plans for the meeting next year were discussed, but no definite action was taken. — *E. W. Manzer.*

WESTERN ARTS ASSOCIATION CONVENTION

Great credit is due to Chas. H. Bailey, vice-president of the Western Arts Association and director of arts and manual arts, Iowa State Teachers College, Cedar Falls, Iowa, for the splendid program which he and his coworkers had arranged for the thirty-seventh annual convention of the Association which was held at Louisville, Ky., on April 28, 29, 30 and May 1, 1931. Unfortunately, the industrial-arts teachers did not attend in numbers large enough to make the splendidly arranged program the real success that it deserved. Probably the absence of the larger number is due to the fact that the convention was spread over so large a part of an entire week. There are very few industrial-arts teachers who can afford to spend so much time away from their classes. The program, however, deserved a larger attendance than it had.

Mr. R. E. Daugherty, supervisor of industrial arts, Louisville, and the industrial-arts and trade classes in the various schools of that city, deserve credit for the staunch and artistic exhibit booths and school exhibit frames which they constructed.

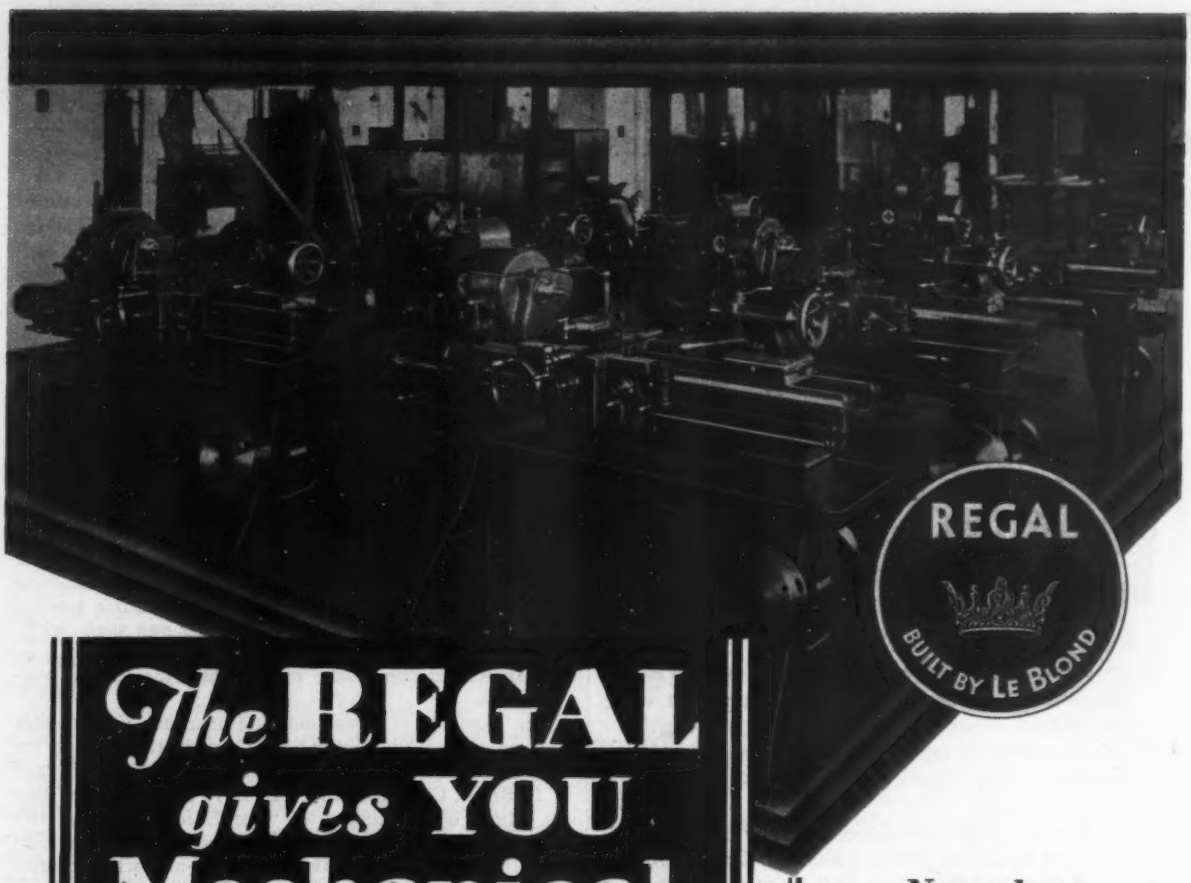
The general theme chosen for the convention was "Widening Aspects of Education in the Arts" and this was quite evident in all of the programs, which emphasized art education as well as the close connection which should exist between art and the work of industrial and commercial enterprises. In the first sectional meeting of especial interest to the industrial-arts teacher, the subjects of "Upgrading the Manual Arts" by T. T. Lindsey, Nashville, and "The Washington Junior High School" by T. R. Abercrombie, Cincinnati, were discussed. Mr. R. E. Daugherty, supervisor of industrial arts, Louisville, Ky., welcomed the visitors, and invited them to visit the various school shops of the city. George C. Donson, supervisor of manual arts, Washington, Pa., presided at this meeting.

Other interesting subjects at sectional and general meetings followed. Frau Emmy Zweybruck, Vienna, Austria, spoke on "The Importance of Handwork in a Mechanical Age and the Education of Applied Arts in Schools" and later, on "Relation Between Folkcraft, Modern Applied Art, and Children's Work."

Harry L. Gage, Mergenthaler Linotype Company, New York, in his various talks entitled "Art and the Business Man," "Fine Arts and the Printer," and "Educational Aspects of Printing," emphasized repeatedly the necessity of combining the fine arts with the manual arts. Anna L. Burdick, Federal Board for Vocational Education, in speaking on the "Aspects of Vocational Education in Relation to Instruction in the Fine and Industrial Arts," also emphasized the same points. The "Discussion of Art Principles Applied to Manual-Art Projects" by Alfred G. Pelikan, director of art, Milwaukee, Wis., was especially noteworthy. It was an illustrated lecture in which the speaker tried to show by actual examples what not to do in the matter of design in school projects.

Teachers of printing were given a real treat in the sectional meeting of the printers by the various speakers on their program. Logan Anderson, R. R. Donnelley & Sons, Chicago, whose subject was "Sidelights on European Printing," described what he observed in his visit to schools of printing on his trip abroad. Thomas E. Dunwoody, Pressman's Home, Tenn., described in his "Story of the 1930 Book of Art Printing" how that wonderful piece of work is produced in his school. Harry L. Gage spoke on "Educational Aspects of Printing."

(Continued on Page 24a)



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BECAUSE of its unusual precision and accuracy its work compels the admiration of student and teacher alike. Its safety features and the elimination of overhanging shafts and belts are typical of modern engineering methods and progressive thought.

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5—Feed rod for the movement of the carriage and cross slide, retaining the accuracy of the lead screw for chasing threads.
6—Self-contained motor drive through multiple V belts.
7—Exceptionally heavy bed reinforced for unusual rigidity and smoother operation.
8—Lathe is made in five sizes—10" to 18"—giving you a wide selection.
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10—Every Regal lathe is subjected to LeBlond precision tests, and carries the LeBlond guarantee.

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certify dimensions of length within one ten-thousandth part of an inch (thirty times finer than a human hair)

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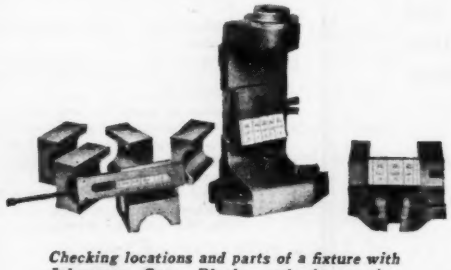

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Prices and literature on application—order direct or through your mill supply dealer

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Detroit, Michigan

(Continued on Page 22a)

On Friday morning, again under the chairmanship of George C. Donson, the topic of "Art in Industry" was discussed by H. B. Nash, Louisville, and J. H. McCloskey, Lakewood, Ohio, spoke on "What is Wrong with Drawing." At this meeting a report was given on the Western Arts Association Terminological Investigation of which Dr. William E. Warner, Ohio State University, Columbus, is chairman.

W. A. Wood, Davenport, Iowa, was elected as chairman of the Manual-Training and Vocational-Education Section for next year. The Printing Section decided to allow the new president of the Association to appoint the chairman of this section for the coming year. Alfred G. Pelikan was chosen chairman of the Art Section for the coming year.

The officers for the year 1931–32 are: President, Belle C. Scofield, assistant supervisor of art, Indianapolis, Ind.; vice-president, Herbert G. Jackson, supervisor of drawing, St. Louis, Mo.; secretary-treasurer, Harry E. Wood, supervisor of industrial arts, Indianapolis, Ind.; auditor, R. E. Daugherty, supervisor of industrial arts, Louisville, Ky.

The next meeting will be held in St. Louis, Missouri.

MANUAL ARTS SUPERVISORS' MEETING

The second annual meeting of the Council of Manual Arts Supervisors was held on April 17 and 18 at the Gladstone Hotel, Chicago. The supervisors who attended this meeting gave evidence of interest, not only in their own work, but in the work of upgrading all of the industrial-arts subjects, by the earnest and businesslike way in which the sessions were carried on.

The question of tests and measurements in shopwork received quite a bit of attention. Those on the program for this subject were Roy R. Van Duzee, of West Allis, Wis., and H. L. Briggs, Cleveland, Ohio. Mr. L. R. Abbott, Grand Rapids, Mich., on the subject of "The Effect of Manual-Arts Shopwork in Classes 10, 11 and 12 after the Junior High School is Introduced" showed that junior-high-school courses everywhere tended to make the shopwork in the senior high school more specific and more informational.

A. G. Bauersfeld, Chicago, discussed the question of "Larger Sized Shop Classes." He presented the arguments both for and against the present tendencies of increasing the size of classes. Mr. A. P. Twogood, Newton, Iowa, discussed the question of "Relation Between Manual Arts and General Education and Between Manual Arts and Vocational Education." He emphasized the importance of having the pupil plan for this work, and showed that it was really the pupil's plan which determined the objectives of the work given by the school.

Time was also given to the discussion of the future of the organization. Standards of limits of membership, selections of new members, etc., were discussed.

The officers for the coming year are as follows: President, L. P. Elliott, director of industrial education, Peoria, Ill., and secretary, William T. Bawden, editor *Industrial Education Magazine*, Peoria, Ill.

ANNUAL PRINTING CONFERENCE

Plans have been completed for the tenth annual conference on printing education, to be held June 22–25, at New York University.

The conference this year will be a four-day conference, instead of three days as in previous years. The morning sessions will be devoted to addresses and discussions, and the afternoon sessions to visits to representative printing plants, schools of printing, and other institutions of special interest to printing teachers. Visits will be made to the plants of the American Type Founders Company in Jersey City and the Mergenthaler Linotype Company in Brooklyn.

Teach Upholstery at Minneapolis, Minnesota

A total of 23 students have enrolled in the course in upholstery in the Boys' Vocational School, Minneapolis, Minnesota.

ADVERTISING PAGES REMOVED

New Publications

Machine Shop Work

By F. W. Turner, Oscar E. Perrigo, and H. P. Fairfield. Cloth, 407 pages, 5½ by 8¼, illustrated. Price, $2.50. Published by the American Technical Society, Chicago, Ill.

The authors have succeeded in gathering under the headings of hand-operated tools, power-driven tools, laying out work, shop suggestions, gear cutting, turret lathes, automatic screw machines, modern manufacturing, and air tools, in a comprehensive way, the things which the machinist, especially the apprentice, should know. A short chapter on the slide rule has been added.

Carpentry Mathematics — Part I

By J. Douglas Wilson and Clell M. Rogers. Cloth, 232 pages, 5½ by 8, illustrated. Price, $1.80. Published by McGraw-Hill Book Co., Inc., New York, N. Y.

This little arithmetic contains a large number of practical problems for the boy who is taking up the carpentry course. The first chapter is entitled "The Woodworking Field," and contains quite a bit of material which has a definite vocational-guidance value.

Perspective Projection

By Ernest Irving Freese. Cloth, 43 pages, 9 by 12, illustrated. Price, $1.50. Published by The Pencil Points Press, Inc., New York, N. Y.

This book presents an interesting method of making perspective drawings without the use of the usual vanishing points. It has been thoroughly tested out by its author who is an architect, and by men to whom he has taught his system. The book is well illustrated and the explanations are concise.

A Student's Work-Book in Guidance

By V. A. Teeter and Arthur C. Douglass. Paper, 135 pages, 8 by 10½. Price, 90 cents. Published by McGraw-Hill Book Company, Inc., New York, N. Y.

This workbook presents a series of lessons, the purpose of which is to guide the student educationally and vocationally. Each lesson contains explanatory material, reading references, and a number of questions that must be answered. There are also review questions consisting of true and false exercises, best answer exercises, and matching exercises.

Modern Alphabets

Compiled by M. B. Cary, Jr. Boards, 64 pages. Price, $1. Bridgman, Publishers, Pelham, N. Y.

This compilation of the most recent European type faces will be of distinct help to the teacher of printing who wants to keep a close touch with tendencies in type design. Students and teachers of commercial art will find it distinctly helpful for making layouts in the spirit of present-day typography.

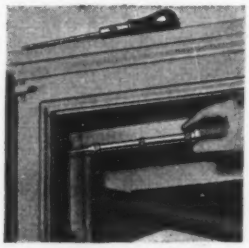
Building Bird Houses from Packing Boxes

How discarded packing boxes may be converted into different types of bird houses has been described by the National Committee on Wood Utilization of the U. S. Department of Commerce, in its publication entitled, *You Can Make It for Camp and Cottage*.

The pamphlet contains more than 100 plans and designs for bird houses. The average boy, with a few simple tools, a can of paint, a brush, and the plans in the booklet, can prepare homes for the common birds. The booklet also contains plans and suggestions for the making of furniture, camp equipment, and numerous articles of utility and convenience. Copies of the booklet may be obtained from the Superintendent of Documents, Government Printing Office, for the small price of 10 cents.

First, make a hole for the screw!

Use the "Yankee" Automatic Push Drill, as illustrated. You operate it simply by pushing on the handle. That is the tool the mechanic uses before he drives a screw . . . to make the right size hole for the screw and save splitting the wood.



No. 41.—Used along with "Yankee" Spiral Screw-driver, by mechanics everywhere. Price, $2.60.

No. 44.—Adjustable Tension regulates pressure to suit kind of wood, size of drill. Price, $3.15.

Mechanics will tell you "Yankee" tool-making can't be copied . . . look for the name "Yankee" when you buy a push drill.

"YANKEE" TOOLS

MAKE BETTER MECHANICS

North Bros. Mfg. Co., Philadelphia, U. S. A.

You may send "Yankee" Tool Book (offered in Industrial Arts)—showing Spiral and Ratchet Screw-drivers, Automatic Push Drills, Ratchet Braces, Socket Bit-Extensions, Ratchet and Plain Breast and Hand Drills, Automatic Chain and Bench Drills, Ratchet Tap Wrenches, Continuous-Work Swivel Vises, Plain Screw-drivers, Etc. *(Please clip and write name and address in margin below)*

A Booklet of Perpetual Value

MACHINIST'S PRACTICAL GUIDE

MORSE

THE MORSE Twist Drill and Machine Company offers a booklet that will be appreciated by students and skilled machinists alike. It contains tables and charts that are of perpetual value, reference material that is continually needed both in the training school and the shop.

Send for as many copies as you need.

The Morse line includes: High Speed and Carbon

DRILLS	CHUCKS
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TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASS., U.S.A.

New Kewaunee Locks
Do Away with Pass Key Troubles

For Student Lockers— Drawers — Cupboards

The day of Pass Keys and all their attending troubles is over. No more need you bother about lost keys, misplaced keys, and keys left at home. Now with Kewaunee Combination Locks students need no keys. They simply work the combination of their locks and the drawer, cupboard or locker door opens. The instructor is provided with a master key with which to unlock the combination locks. Thus, for the first time, you have all the advantages of a master keying system and none of the disadvantages of the pass key locks.

Write for Lock Folder

We have prepared a very attractive folder that pictures and fully explains all Kewaunee Master Keyed Combination Locks. Write for it today. See how the Master Key system works. All locks automatically lock when closed. The dial cannot move when lock is open. All locks are furnished with or without Master Key or Click Device for opening in dark. Send for folder today.

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Combination Lock No. K-46

Combination Lock No. K-45A (Front View)

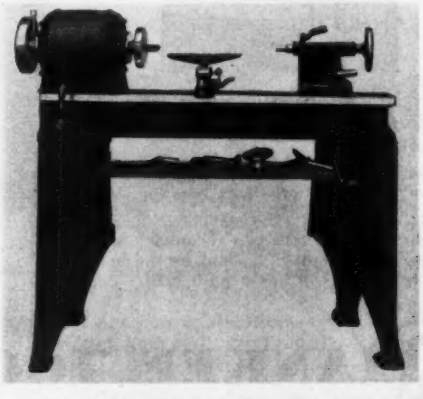
Combination Lock No. K-45A (Rear View)

SCHOOL SHOP EQUIPMENT NEWS

For the Supervisor or Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

NEW BLOUNT MOTOR HEADSTOCK LATHE

The J. C. Blount Company, Everett, Mass., manufacturers of machine tools, has announced a new spindle-locking device for their well-known motor headstock lathe.



The device is simple, effective, and requires very little effort or time in removal of the most tightly seized faceplates. A locking pin at the rear of the spindle in the back of the outside faceplate is inserted through a boss on the motor end-shield flange. The pin sets into a countersunk hole in the spindle, which holds the spindle rigid. Both inside and outside faceplates have deep rims and a special wrench applied to the rim quickly and easily removes the faceplate. The rim faceplates offer another advantage in that they are stronger and their well-rounded edges increase safety.

ALGOMA PANEL COMPANY TAKES OVER CLAUS PANEL COMPANY

The Algoma Panel Co., of Algoma, Wis., has announced the merger of the Algoma Company with the Claus Panel Company, of Cleveland, Ohio, and the incorporation of the firm under the name of the Algoma Plywood and Veneer Company.

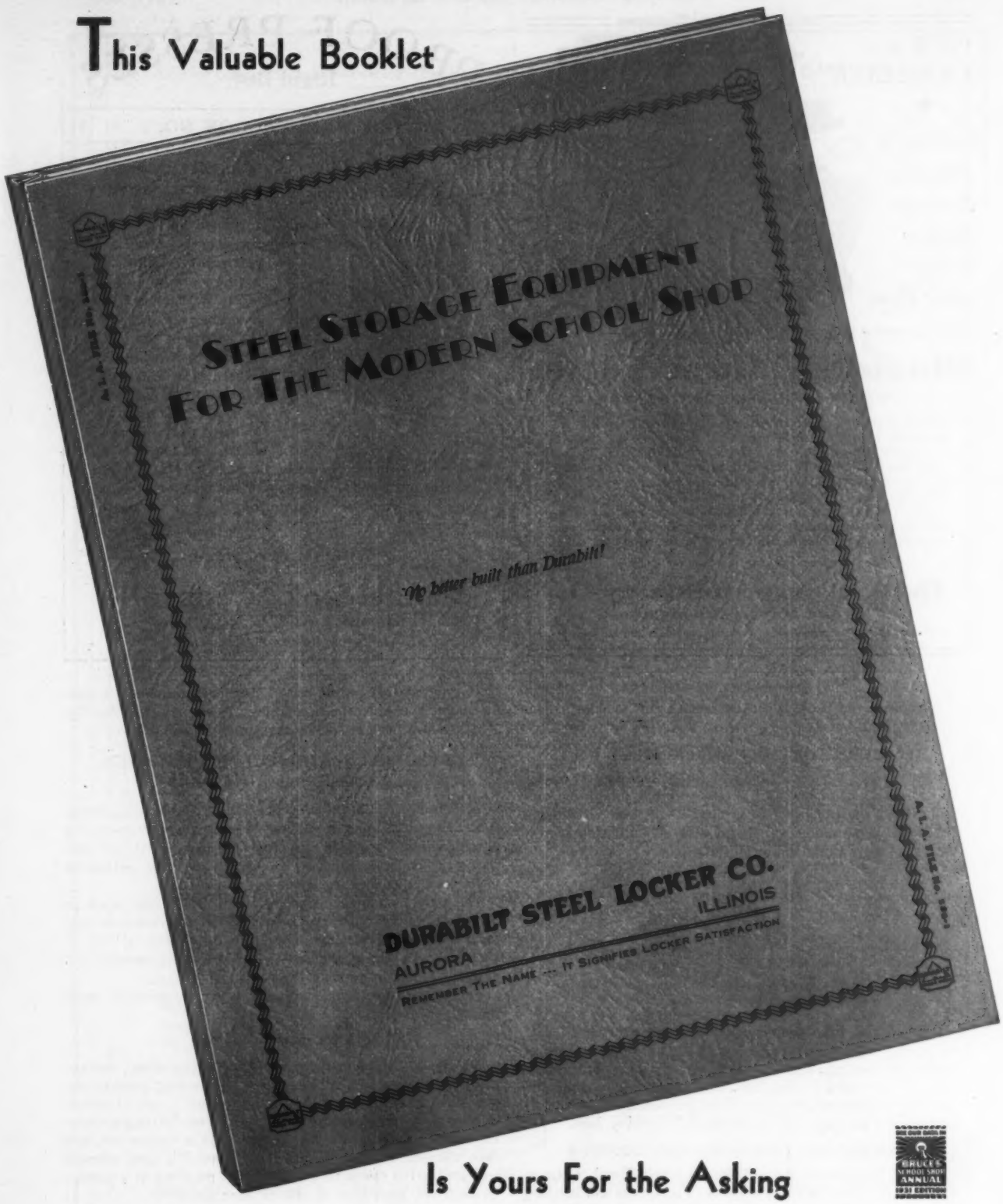
NEW SAW AND TOOL MANUAL

Henry Disston & Sons, Inc., Philadelphia, Pa., manufacturers of Disston saws, tools, knives, and files, has issued a new saw, tool, and file manual for manual-training shops.

The booklet, which contains 48 pages, devotes considerable space to the selection and use of handsaws, small saws, compass, and hack saws, the selection and use of circular saws, the selection and use of try-squares and bevels, gauges, cabinet scrapers, and files, and the proper care of saws, tools and files. There is a suggestive list of tools for saw setting, and tools for home, shop, and farm use.

(Continued on Page 30a)

This Valuable Booklet



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A coupon is attached for your convenience

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"IT'S A CHALLENGE"

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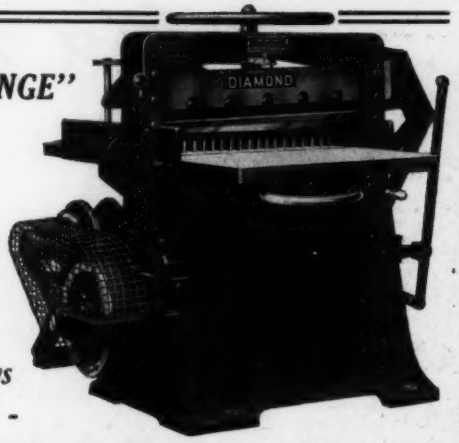
—there's never a Serious Injury when your Boys use a - - -



Diamond Power Cutter

with the Frazee-Saur Safety Device

To keep this machine in operation it is necessary for the operator to hold *both* levers. There's simply no chance for careless hands to get in the way of the knife. That's why the Challenge Frazee-Saur Safety Device makes the Diamond Cutter a *safe* machine for student work . . . What's more the Diamond never "repeats" its stroke—that's a feature you can't afford to overlook—a definite protection against costly errors. Learn about *all* the features of this remarkable cutter. Write today for data.

Send for the Printers' Album—It's Free!

The Challenge Machinery Co.

Grand Haven, Michigan

Chicago, 17-19 E. Austin Ave. New York, 200 Hudson St.

82

PROOF PRESSES

Rigid Bed

THE VANDERCOOK NO. 1

An efficient, reliable proof press for the school print shop. Unsurpassed in its class for accuracy and dependability. Discriminating school buyers everywhere specify Vandercook because they appreciate the great accuracy of which these presses are capable. The Vandercook No. 1 is an ideal machine for all hand-inking work within its size. It will handle easily all work in the average school print shop. Investigate this machine before ordering your new equipment. It will be worth your while.

Write for our catalog

Vandercook & Sons

900 N. Kilpatrick Ave., Chicago, Ill.

Originators of the Modern Proof Press

(Continued from Page 28a)

A copy of the booklet will be sent to any school-shop instructor upon request.

PAASCHE PORTABLE AIRPAINTING UNITS

The Paasche Airbrush Company, 1909 Diversey Parkway, Chicago, Ill., has announced a new portable airpainting unit of ½ h.p., which plugs into a 110- or 220-volt circuit and releases a large volume of air pressure sufficient for a great variety of airpainting and airfinishing jobs.

The portable airpainting equipment is compact, sturdy, light in weight, and permits easy portability through the use of rubber-tired rollers. It is equipped with the Paasche patented features of copper cooling coil with water and oil separator, which provides clean, dry air without pulsation. It is especially adapted for medium-sized painting and finishing jobs.

WEIDENHOFF CONTACT SYNCHRONIZER

Joseph Weidenhoff, Inc., 4344 Roosevelt Road, Chicago, Ill., manufacturers of electrical service materials and supplies, has announced its new contact synchronizer, for the adjustment of ignition systems used on high-speed, high-compression motors.

The Weidenhoff synchronizer is constructed of bakelite, and synchronizes with either high-tension spark or lamps. The distributor may be rotated by the starter, but when preferred, the distributor may be raised to disengage the gears and the contacts synchronized by the use of the lamps provided. A contact point and brush tension scale has been provided for the proper adjustment of the breaker-arm tension springs.

NEW UNDERNEATH BELT MOTOR-DRIVEN SOUTH BEND LATHE

The South Bend Lathe Works, 427 East Madison St., South Bend, Ind., has announced a new back-geared, screw-cutting precision lathe, which is a compact, self-contained unit featuring the underneath belt drive, with power unit and motor inclosed in a cabinet leg under the headstock.

The lathe is designed and built for production work in manufacturing, for fine precision work in the toolroom, and for all classes of machine-shop work. The lathe is built in various sizes and in a variety of bed lengths, suitable for different kinds of work.

Complete information and prices are obtainable upon request.

NEW FOLEY HAMMER SAW SET

The Foley Mfg. Company, of Minneapolis, Minn., has announced the development of a new handy type of hammer saw set, which features easy trigger action and a special pistol-grip set for all handsaws. A light pressure on the trigger draws the hammer back against the spring, which is compressed, and then released by a small dog. The hammer is then released and strikes the saw with a sharp blow, resulting in a perfect uniform set, regardless of soft or hard spots.

A special adjustment screw on the end of the barrel holds the spring to obtain more or less set, depending on the size or teeth, or the amount of set desired. The hammer set may be used on all sizes and kinds of band saws from 3 to 16 points to the inch.

Complete information and prices may be obtained by any school-shop instructor upon request.

A State Summer School with a National Reputation conducted by the New Jersey State Board of Education

Ocean City State Summer School

OCEAN CITY, NEW JERSEY

(Do not confuse Ocean City with Ocean Grove, they are several miles distant from each other)

• •

The 1931 Session starts June 29 and closes August 1, a period of five weeks, six days a week

PRINTING COURSES

Certificates Granted

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College Credits Awarded

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SCHEDULE

Organized as a two-year program, four courses are given under the head of printing.

	Hours		Total	Credits
Principles and Practice Printing I . . .	60	60	120	2
Teacher Training Printing II . . .	45	45	90	3
Linoleum Block Printing III . . .	30	30	60	1
Bookbinding Printing IV . . .	30	30	60	1
**Professional Subjects* . .	60	60	120	4

**A minimum of 120 hours' work in professional subjects, such as Psychology, Principles of Education, Junior High School Practice and Tests and Measurements, will be required for a Certificate. This work must be completed in two summers at Ocean City, unless credits earned elsewhere are presented and accepted as evidence of equivalent previous preparation.*

Including Elementary Bookbinding and Linoleum Block Printing

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Since 1915, printing courses have been conducted in the Ocean City State Summer School and during that time students have been enrolled from nineteen states. So far as known, the Certificates granted and credits awarded have never been refused acceptance by any state or college. These courses have been highly commended by State Vocational Department officials. Through a special arrangement, Ocean City students may receive credit on the Extension Vocational Teacher Training Curriculum of Pennsylvania and New York states toward certificates and licenses.

As the major course in the Printing Department is a "Methods" Course, a large outfit is not necessary. No instruction in machine composition, cylinder or automatic presswork is furnished. The printing outfit corresponds to that usually installed in a junior high school.

TUITION RATE

Tuition rate for non-residents of New Jersey is $15 for each course. Residents of New Jersey or teachers engaged to teach in New Jersey schools are not required to pay tuition charges.

ROOMS AND BOARD

A very low rate for room, including meals, has been arranged for the first twenty-five students enrolling in the Printing Courses.

Rates are as follows:

For three persons in a room, $10.00 per week.
For two persons in a room, $12.50 per week.
Single room, $15.00 per week.

The above rates include board. As these rates are limited to the first twenty-five students registering for Printing Courses it is suggested that you enroll at once.

The Courses in Printing at the Ocean City State Summer School are under the personal direction of *Frank K. Phillips*, Manager of the *Education Department, American Type Founders Company*, 300 Communipaw Ave., Jersey City, N. J.

Dr. W. A. ACKERMAN, Director, New Jersey State Summer Schools
GEORGE E. HUCKINS, Teacher of Methods
MISS GRACE W. ENGELS, Supervisor of Practical Arts
MISS ALICE H. ENGELS, Teacher of Bookbinding and Linoleum Block Printing

An Outlet for Energy with Exceptional Results

Art-Fibre furniture weaving is "fun" for both student and teacher. It directs the energies along practical lines with only a small amount of supervision from the teacher. The interest and enthusiasm manifested diverts the thinking from innocent but mischievous pranks, to harmonious coöperation.

STEP-BY-STEP, CLEAR, LUCID WORK SHEETS, ELIMINATE MUCH OF THE TEACHER'S LABOR.

ART-FIBRE WEAVING

Is being taught in hundreds of schools, throughout the country; rural schools, town schools, and large city schools, high schools and normal schools.

Projects are furnished complete ready to assemble and weave.

Many schools conduct the classes in their regular classroom.

Write for literature.

FOR NEXT SEMESTER

Be sure and include colored Art-Fibre Cord weaving projects.

Save on the initial cost, eliminate water soaking or preliminary preparation. Select projects adaptable to particular classes.

Create an entirely new atmosphere, with the smallest amount of expense and effort imaginable.

ONE TEACHER SAYS—"I never have a day pass without someone asking, 'Are we going to have Art-Fibre today? Gee, I wish we would.' This is typical of the enthusiasm which students manifest." Another teacher makes this statement: "This is one subject that can be successfully taught in any school. Small schools where the budget is limited as well as in the larger institutions, because there is no initial outlay for tools and equipment."

GRAND RAPIDS FIBRE CORD CO.
GRAND RAPIDS, MICH.

News Notes

Summer Course at Wyoming University

The University of Wyoming, Laramie, will offer a special three weeks' course for teachers of vocational agriculture during the period of August 10 to 28. Two special courses will be available for teachers of vocational agriculture, one of which is an advanced course in agricultural education covering farm-shop work suited to the needs of a community, and another, a course in administration of vocational education, comprising phases of organization and administration of vocational agriculture. These courses will be conducted by Mr. Louis M. Roehl, of the department of agricultural engineering, Cornell University, who has specialized in teaching farm-shop work for several years and is well known as an author and teacher on that subject.

Establish Chapter of Epsilon Pi Tau Fraternity

A chapter of Epsilon Pi Tau, honorary professional fraternity in industrial arts and vocational education, has been established at Miami University. The formal installation ceremony took place on Saturday, May 9, in the presence of delegates from other chapters who had been invited as guests.

New Industrial High School for Boys

The New York City school board has approved a contract calling for plans and specifications for the Samuel Gompers Industrial High School for Boys, which is to be erected at an estimated cost of $1,015,000. The building will provide a variety of shops with special facilities for young workers preparing to enter the automobile, electrical, and printing industries. The school will have shops for sheet metal, plumbing, forging, millroom, machine, architectural drawing, mechanical drawing, blue-printing rooms, and auxiliary rooms in addition to thirteen classrooms, an auditorium, a gymnasium, a cafeteria, a teachers' lunchroom, a radio room, a workroom, and offices.

Vocational Guidance Classes Predicted

Compulsory vocational-guidance courses as part of a universal education system in the United States has been predicted by E. T. Franks, vice chairman of the Federal Board for Vocational Education. Mr. Franks pointed out that the schools of the country are not supplying a balanced program, and stated that 92 per cent of the gainfully employed population works with its hands, while 8 per cent are in professional occupations.

School Children Produce Stained Glass

Pupils in the Puritas School, Cleveland, Ohio, have produced stained glass, similar to the mosaics of ancient cathedrals, with their monks and knights, which add color and warmth to the school library.

The entire eighth-grade class, comprising fourteen pupils, worked for weeks drawing designs, transferring the designs to transparent linen tissue, and painting the water colors. The school is planning an exposition where the work of the pupils will be displayed.

Fisher Body Craftsman's Guild Organized

The Fisher Body Corporation, Detroit, Mich., has announced the organization of the Fisher Body Craftsman's Guild for stimulating craftsmanship among the boys of the country and for perpetuating the ideals of the ancient craft guilds.

To give incentive to boys to enroll in the guild and to undertake the labor of true craftsmen, the guild provides

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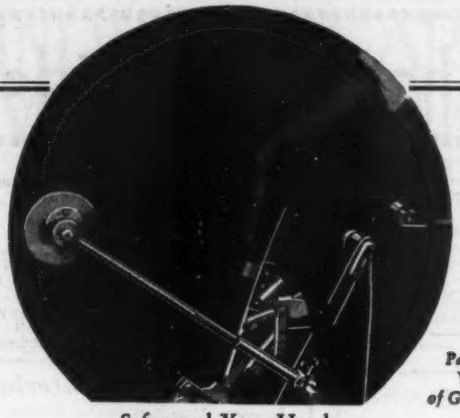

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(Continued from Page 32a)

opportunity to earn a four-year university scholarship valued at $5,000, or one of 980 other valuable awards including trips to the automotive center of the world and purses of gold. Any boy between the ages of 12 and 19 years is eligible to enter the competition if he enrolls with any General Motors dealer in his own community.

Broadhead-Garrett Company Prize Contest

The Broadhead-Garrett Company, of Cleveland, Ohio, has announced a prize essay contest on lumber for schoolwork. Three cash prizes of $200, $100, and $50 are offered for the best essays. The contest closes June 30 and awards will be made as promptly as possible.

Tenth Conference on Printing Education

The tenth annual conference on printing education will be held June 22–25, at New York University, New York City. The topic will be "Closer Coöperation Between Education and Industry." Five sessions will be devoted to the teacher. The afternoon sessions will be given over to printing and plant visitations. Two surveys will be made; namely, a survey of printing instruction, and a survey of courses of study.

Girls Work in Shops at Madison, South Dakota

Under the direction of A. W. Bondurant, director of manual training at Madison, S. Dak., a class of fifteen girls, ranging from freshmen to seniors in the high school, are giving two periods per week to manual-training work, making small cabinet pieces and furniture. The girls have made tables, magazine stands, writing desks, and wall shelves. The work of girls in the shop was begun last year, when a group of girls persuaded the instructor to help them make things. This year the work was organized on a club basis, with the girls taking the shopwork instead of other club activities. A group of boys in the school is taking cooking as their club project. They spend two hours a week in the domestic-science rooms, and recently served a dinner to their mothers and the faculty of the school.

Second Lincoln Arc Welding Prize Competition

The Lincoln Electric Company, Cleveland, Ohio, has announced the Second Lincoln Arc Welding Prize Competition, which is intended to increase the knowledge of the adaptability of arc welding to industry, and to focus the attention of management and engineering departments of manufacturing companies on the subject so that they will turn to arc welding as a manufacturing tool. A total of seven cash prizes is offered, involving a cost of $17,500. The contest closes on October 1, 1931, when all papers must be in the hands of the firm.

Vocational Guidance in South Bend, Indiana

The department of vocational and educational guidance of South Bend, Ind., is under the direction of Miss Helen Dernbach. It aims to guide the vocational futures of students in the junior and senior high schools and in the boys' and girls' prevocational classes; it conducts a placement bureau; and it coöperates with local agencies and the parent-teacher association in caring for handicapped and delinquent pupils.

A four-year plan of guidance has been worked out by which data on all pupils are gathered and checked each semester as the pupil is promoted. This enables the department to aid each child individually, and to help him adjust his course to his needs.

With the aid of an assistant, Miss Dernbach has charge of the general supervision of the plan of organization and administration of the work in the placement bureau, which seeks to find jobs, either part time or full time, for boys and girls who need to earn money. An effort is made to find after-school jobs for boys and girls needing financial help, permitting them to remain in school.

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